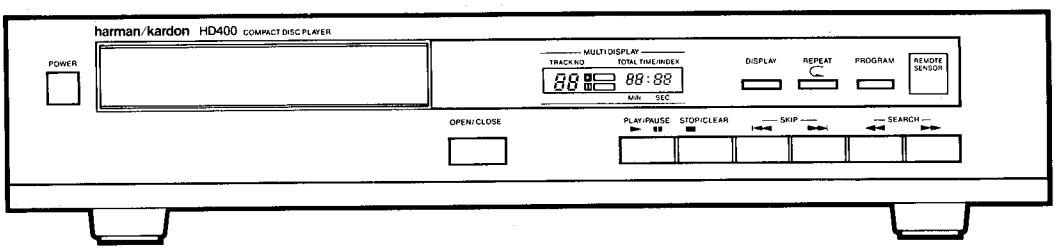
The Harman Kardon Model HD400

Manual 127A

COMPACT DISC PLAYER

Technical Manual



The following marks found in the parts list of this manual identify the models as follows.

- (UA) : North America area model
- (BK) : North America area model Black version
- (G) : General model
- (GB) : General model Black version

harman/kardon
240 Crossways Park West, Woodbury, N. Y. 11797
1112-3152127A1 P-078801 1500 Printed in Japan

HD400

CLASS 1 LASER PRODUCT
Product complies with DHHS rules CFR subchapter J part 1040:10 at date of manufacture.

DANGER—invisible laser radiation when open and interlock failed or defeated. Avoid direct exposure to the beam.

CAUTION—use of all controls, adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Be Careful of the Laser Pickup
Although you cannot see it from the outside, a laser pickup is located under the disc tray and a precision lens is built in it.
Since the laser pickup, including the lens element, is especially sensitive to dust, keep the disc tray closed when not in use. Also do not put your hand inside the unit.

CLASS 1
LASER PRODUCT

SPECIFICATIONS

System	:Compact Disc Digital Audio
Signal Detection	:3-Beam Semiconductor Laser
Error Correction	:CIRC System
Sampling Frequency	:88.2kHz
Quantization	:16-bit
Channels	:2 Channel Stereo
Frequency Response	:4Hz—20kHz ±0.5dB
Total Harmonic Distortion	:0.03% (1kHz)
Dynamic Range	:96dB
Signal-to-Noise Ratio	:103dB
Channel Separation	:83dB (1kHz)
Wow & Flutter	:Immeasurable
Line Output Level/Load Impedance	:2.0V/10k Ohms
Power Supply	
U.S.A. and Canada models	:AC 120V, 60Hz
General model	:AC 220/240V, 50/60Hz
Power Consumption	:15 Watts
Dimensions (W x H x D)	:17-3/8" x 3-3/4" x 10-1/8" (443 x 95 x 257 mm)
Weight	:8.5lbs. (3.9kg)

Specifications and components subject to change without notice. Overall performance will be maintained or improved.

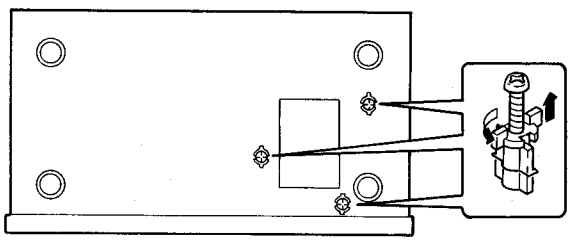
Adjustment of this unit requires following measuring instruments and jigs.

- Oscilloscope (3 or more modes, 100MHz, X-Y input possible) 1740A
- Distortion Meter 339A
- Test Disc:
  EIAJ CD-1

IMPORTANT

Before plugging the unit in, be sure to remove the transportation screws on the bottom of the unit.

1. Place a cloth under the unit in order to prevent if from being scratched.
2. Turn the unit upside down.
3. Remove the three transportation screws with a screw driver, as shown in the illustration below.



NOTE: Be sure to tighten screws by the reverse procedure before transporting the unit.

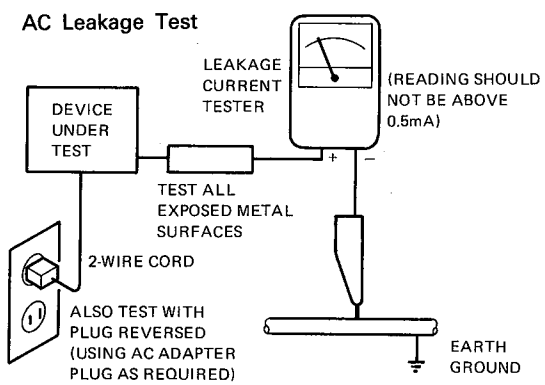
SAFETY PRECAUTIONS

Before returning an instrument to the customer, always make a safety check of the entire instrument, including, but not limited to, the following items:

a. Be sure that no built-in protective devices are defective and/or have been defeated during servicing.
   (1) Protective shields are provided to protect both the technician and the customer. Correctly replace all missing protective shields, including any removed for servicing convenience.
   (2) When reinstalling the chassis and/or other assembly in the cabinet, be sure to put back in place all protective devices, including, but not limited to, nonmetallic control knobs, insulating fishpapers, adjustment and compartment covers/shields, and isolation resistor/capacitor networks.
   Do not operate this instrument or permit it to be operated without all protective devices correctly installed and functioning.

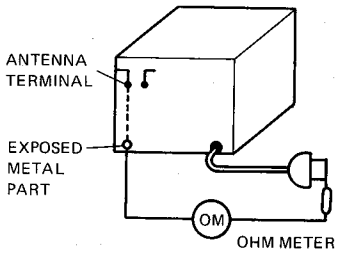
b. Be sure that there are no cabinet openings through which an adult or child might be able to insert their fingers and contact a hazardous voltage. Such openings include, both are not limited to, excessively wide cabinet ventilation slots, and an improperly fitted and/or incorrectly secured cabinet back over.

c. **Leakage Current Hot Check** — With the instrument completely reassembled, plug the AC line cord directly into a 120V AC outlet. (Do not use an isolation transformer during this test.) Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI) C101.1 "Leakage Current for Appliances" and Underwriters Laboratories (UL) 1270, (34.6). With the instrument AC switch first in the ON position and then in the OFF position, measure from a known earth ground (metal waterpipe, conduit, etc.) to all exposed metal parts of the instrument (antennas, handle bracket, metal cabinet, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. Any current measured must not exceed 0.5 milliamp. Reverse the instrument power cord plug in the outlet and repeat test. **ANY MEASUREMENTS NOT WITHIN THE LIMITS SPECIFIED HEREIN INDICATE A POTENTIAL SHOCK HAZARD THAT MUST BE ELIMINATED BEFORE RETURNING THE INSTRUMENT TO THE CUSTOMER.**



d. **Insulation Resistance Test**
   (1) Unplug the power supply cord and connect a jumper wire between the two prongs of the plug.
   (2) Turn on the power switch of the instrument.
   (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each **exposed metallic** cabinet part on the instrument, such as screwheads, antenna, control shafts, handle brackets, etc. The reading should be as shown below. If it is not within the limits specified, there is the possibility of a shock hazard, and the instrument must be repaired and rechecked before it is returned to the customer.

e. **Insulation Resistance Test Cold Check**
   (1) Unplug the power supply cord and connect a jumper wire between the two prongs of the plug.
   (2) Turn on the power switch of the instrument.
   (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each **exposed metallic** cabinet part on the instrument, such as screwheads, antenna, control shafts, handle brackets, etc. When the exposed metallic part has a return path to the chassis, the reading should be between 1 and 5.2 Megohm. When there is no return path to the chassis, the reading must be "infinite". If it is not within the limits specified, there is the possibility of a shock hazard, and the instrument must be repaired and rechecked before it is returned to the customer.



PRODUCT SAFETY NOTICE

Some electrical and mechanical parts have special safety related characteristics which are often not evident from visual inspection, nor can the protection they give necessarily be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified by shading, by (⚠) on schematics and parts listed. Use of a substitute replacement that does not have the same safety characteristics as the recommended replacement part might create shock, fire, and/or other hazards. Products Safety is under review continuously and new instructions are issued whenever appropriate.

SERVICING PRECAUTIONS

CAUTION: Before servicing instruments covered by this manual and its supplements, read and follow the SAFETY PRECAUTIONS on this page.
NOTE: If unforeseen circumstances created conflict between the following servicing precautions and any of the safety precautions, **always follow the safety precautions.** Remember: Safety First.

General Servicing Precautions

a. Always unplug the instrument AC power cord from the AC power source before:
   (1) Removing or reinstalling any component, circuit board, module, or any other instrument assembly.
   (2) Disconnecting or reconnecting any instrument electrical plug or other electrical connection.
   (3) Connecting a test substitute in parallel with an electrolytic capacitor in the instrument.
   Caution: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.

b. Do **not** defeat any plug/socket B+ voltage interlocks with which instruments covered by this manual might be equipped.

c. Do **not** apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.

d. Always connect a test instrument's ground lead to the instrument chassis ground before connecting the test instrument positive lead. Always remove the test instrument ground lead last.

NOTE: Refer to Safety Precautions on Page 3.

(1) The service precautions are indicated or printed on the cabinet, chassis or components. When servicing, follow the printed or indicated service precautions and service materials.

(2) The Components used in the unit has a specified conflammability and dielectric strength. When replacing any components, use components which has the same ratings. Components marked (⚠) in the circuit diagram are important for safety or for the characteristics of the unit. Always replace with the appointed components.

(3) An insulation tube or tape is sometimes used and some components are raised above the printed wiring board for safety. The internal wiring is sometimes clamped to prevent contact with heating components. Install them as they were.

(4) After servicing, always check that the removed screws, components and wiring have been installed correctly and that the portion around the service part have not been damaged and so on. Further check the insulation between the blades of attachment plug and accessible conductive parts.

Insulation Checking Procedure

Disconnect the attachment plug from the AC outlet and turn the power on. Connect the insulation resistance meter (500V) to the blades of the attachment plug. The insulation resistance between the each blade of the attachment plug and accessible conductive parts (Note 1) should be more than 1M-ohm.

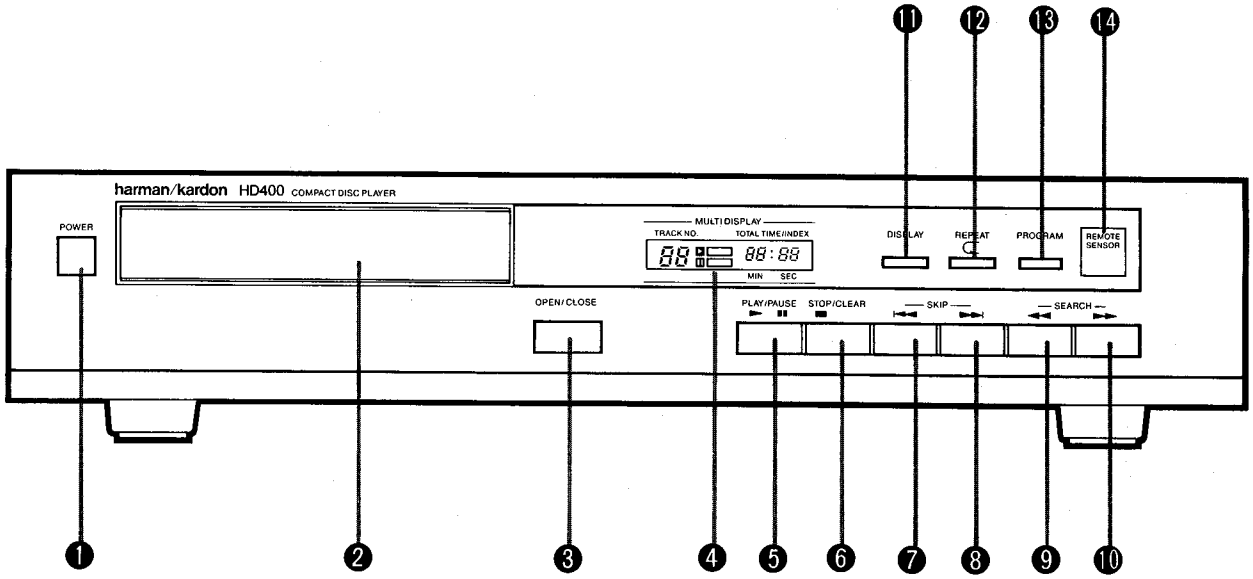
Note 1: Accessible Conductive Parts including Metal panels, Output jacks, etc.

ELECTROSTATICALLY SENSITIVE (ES) DEVICES

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some fieldeffect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charge sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
   CAUTION: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device).

CONTROLS AND FUNCTIONS



❶ POWER SWITCH
Pressing this switch will turn on the power. Press the switch again to turn the power off.

❷ DISC TRAY
By pressing the "OPEN/CLOSE" button, the tray onto which the discs are loaded will slide out.

❸ OPEN/CLOSE BUTTON
Press this button to open or close the DISC TRAY. Press it once to make the DISC TRAY slide out, and again to make the DISC TRAY slide in.

❹ MULTI DISPLAY
Displays the track number during playback, and displays elapsed playback time from the beginning of the program being played or the index number during stop mode.

❺ PLAY/PAUSE BUTTON
Press this button to start playback. Pressing this button during playback activates the pause mode. Playback continues when this button is pressed again.

❻ STOP/CLEAR BUTTON
Press this button to stop playing a disc or to cancel the pause mode. Press the button once again to erase the memory program.

❼ ⏮ ◁ BUTTON (SKIP)
Pressing this button once skips playback backward to the beginning of the present program. Pressing it once more skips it to the beginning of the previous program, pressing it twice skips it to the beginning of the program before that, and so on.

❽ ▷ ⏭ BUTTON (SKIP)
Pressing this button once skips playback forward to the beginning of the next program. Pressing it twice skips it to the beginning of the program after that, and so on.

❾ ◁ ◁ BUTTON (REVERSE SEARCH)
Pressing this button starts low speed reverse. Holding the button down longer than two seconds changes the reverse mode to high speed. Sound can be heard at a reduced level in this mode. Also, when this button is pressed in the stop mode, the index number is decreased.

❿ ▷ ▷ BUTTON (FAST-FORWARD SEARCH)
Pressing this button starts low speed fast-forwarding. Holding the button down longer than two seconds changes the fast-forward mode to high speed. Sound can be heard at a reduced level in this mode. Also, when this button is pressed in the stop mode, the index number is increased.

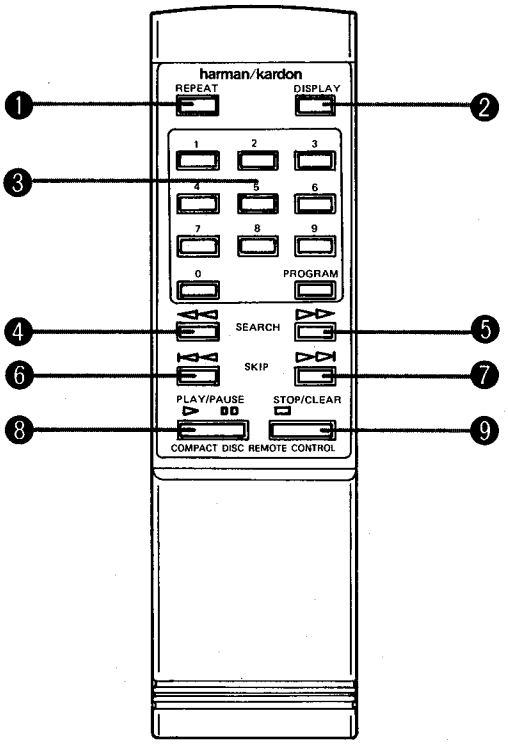
⓫ DISPLAY BUTTON
Press to change the display. When pressed, display is switched between the elapsed playback time of a track and the time remaining before the end of the last selection. The display is also switched to the remaining number of programs during program playback.

⓬ REPEAT BUTTON
Pressing this button enables continuous repeat playback of the disc. Pressing this button again disables the repeat playback mode. Pressing this button while in memory playback repeats the programs stored in the memory.

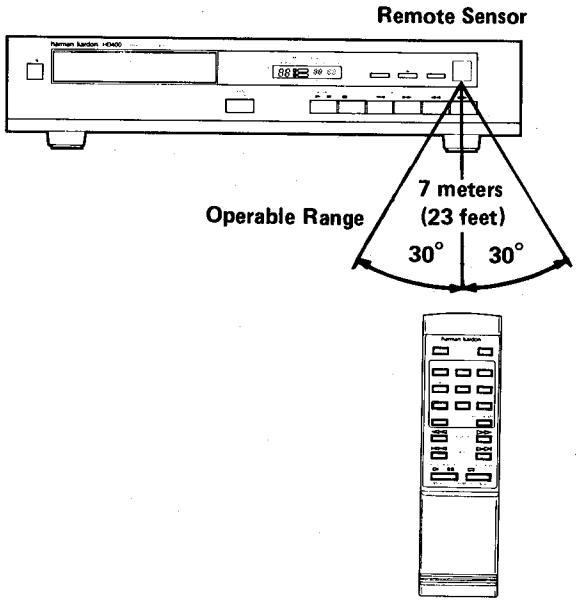
⓭ PROGRAM BUTTON
Used to program the memory for non-sequential playback of disc tracks. Up to 36 program selections can be stored in the memory.

⓮ REMOTE CONTROL SENSOR
Receives signals from the supplied remote control unit.

REMOTE CONTROL



Use the remote control unit within the range shown in the diagram below.



NOTE: When changing the batteries of the remote control, insert the batteries with their polarity aligned according to the diagram on the back of the battery case. 2 AA size (UM-3) batteries are recommended.

❶ REPEAT BUTTON
Refer to the main unit's Repeat Button section.

❷ DISPLAY BUTTON
Refer to the main unit's Display Button section.

❸ 10-KEY INPUT BUTTONS
Press these buttons to facilitate programming and track access.

❹ ◁◁ BUTTON (REVERSE)
Refer to the main unit's ◁◁ Button section.

❺ ▷▷ BUTTON (FAST-FORWARD)
Refer to the main unit's ▷▷ Button section.

❻ |◁◁ BUTTON (PROGRAM SELECTION)
Refer to the main unit's |◁◁ Button section.

❼ ▷▷| BUTTON (PROGRAM SELECTION)
Refer to the main unit's ▷▷| Button section.

❽ PLAY/PAUSE BUTTON
Refer to the main unit's Play/Pause Button section.

❾ STOP/CLEAR BUTTON
Refer to the main unit's Stop/Clear Button section.

DISASSEMBLY PROCEDURES (REFER TO PAGES 29 through 32 and 34)

[1] CABINET TOP (122) REMOVAL

Remove 7 screws (A) and then remove the Cabinet Top (122).

[2] FRONT PANEL ASS'Y (AC) REMOVAL

1. Remove the Cabinet Top (122), referring to the previous step [1].
2. Pull off Power button (139).
3. Remove 7 screws (B) and then remove the Front Panel Ass'y (AC) with the Front P.C. Board (PCB-2).
4. Remove 4 screws (C) and then remove the Front P.C. Board (PCB-2) from the Front Panel Ass'y (AC).

[3] MAIN P.C. BOARD (PCB-1) REMOVAL

1. Remove the Front Panel Ass'y (AC), referring to the previous step [2].
2. Unsolder the jumper leads (JL101, JL102, JL103, JL104 and JL105) from Front P.C. Board (PCB-2) and then remove the Front P.C. Board (PCB-2).
3. Open the lid of connectors (CN101, CN102 and CN105) on the Main P.C. Board (PCB-1) and then disconnect the lead wires.
4. Remove 2 screws (D) and then remove the Pickup Drive P.C. Board (PCB-4).
5. Open the lid of connectors (CN103 and CN104) on the Main P.C. Board (PCB-1) and then disconnect the lead wires.
6. Remove 4 screws (E) and then remove the Main P.C. Board (PCB-1).
   If necessary, unsolder the lead wires connected to the PCB-1.

[4] CD PLAYER MECHANICAL ASSEMBLY REMOVAL

1. Remove the Front Panel Ass'y (AC), referring to the previous step [2].
2. Open the lid of connectors (CN103 and CN104) on the Main P.C. Board (PCB-1) and connector (CN502) on the Pickup Drive P.C. Board (PCB-4) and then disconnect the lead wires.
3. Remove 2 screws (D) and then remove the Pickup Drive P.C. Board (PCB-4).
4. Remove 3 screws (F) and then remove the CD Player Mechanical Assembly (103).

DISASSEMBLING THE CD PLAYER MECHANICAL ASSEMBLY

[5] DISC TRAY REMOVAL

1. Remove the Cabinet Top (122), referring to the previous step [1].
2. Connect the Power cord and turn on the power by pressing the Power switch.
3. Open the Disc Tray (6) by pressing the Open/Close button.
4. With the Disc Tray (6) opened as it is, pull out the power plug.
5. Push the Disc Tray (6) by hand to slide it in once and then slide it out again.
6. Pull out the Disc Tray while disengaging the Tray Lock Pawl (Shown in Adjustment Points location on next page) in the direction of arrow with screwdriver or the like.

[6] OPTICAL PICK-UP REMOVAL

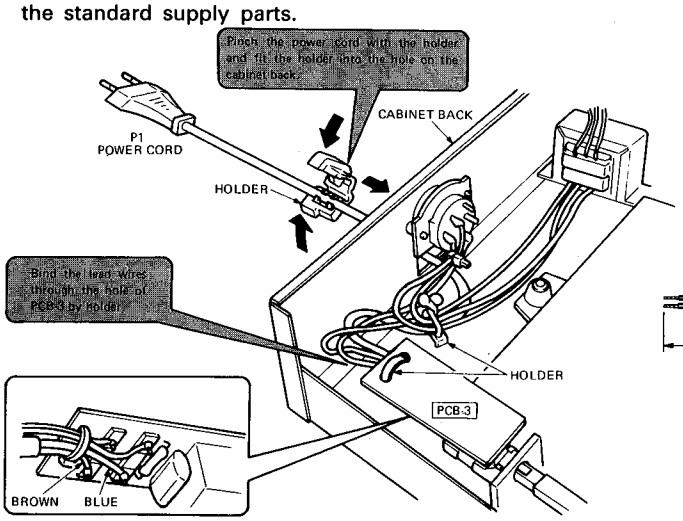
1. Remove the CD Player Mechanical Assembly (CA), referring to the previous step [4].
2. Remove 4 screws (G), then remove the Optical Pick-Up Base Assembly (2).
3. Remove 1 screw (H) and Pick-Up Base Shaft Holder (5), then remove the Pick-Up (32).

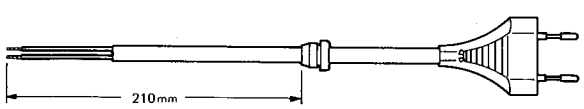
[7] SPINDLE MOTOR ASSEMBLY REMOVAL

1. Remove the CD Player Mechanical Assembly (103), referring to the previous step [4].
2. Remove the Chuck Arm Spring (22).
3. Undo 2 catches fixing the Chuck Arm (10) to the right and left and remove the Chuck Arm (10).
4. Remove 2 screws (I) fixing the Spindle Motor Assembly (48) and then remove the Spindle Motor Assembly (48). Align the holes in the Spindle Table to the screw (I) positions for the screw removal.

POWER CORD REPLACEMENT (FOR SERVICE ENGINEERS OTHER THAN NORTH AMERICA)

In order to prevent fire or shock hazard when replacing the power cord, follow the procedure below to replace the part with the standard supply parts.





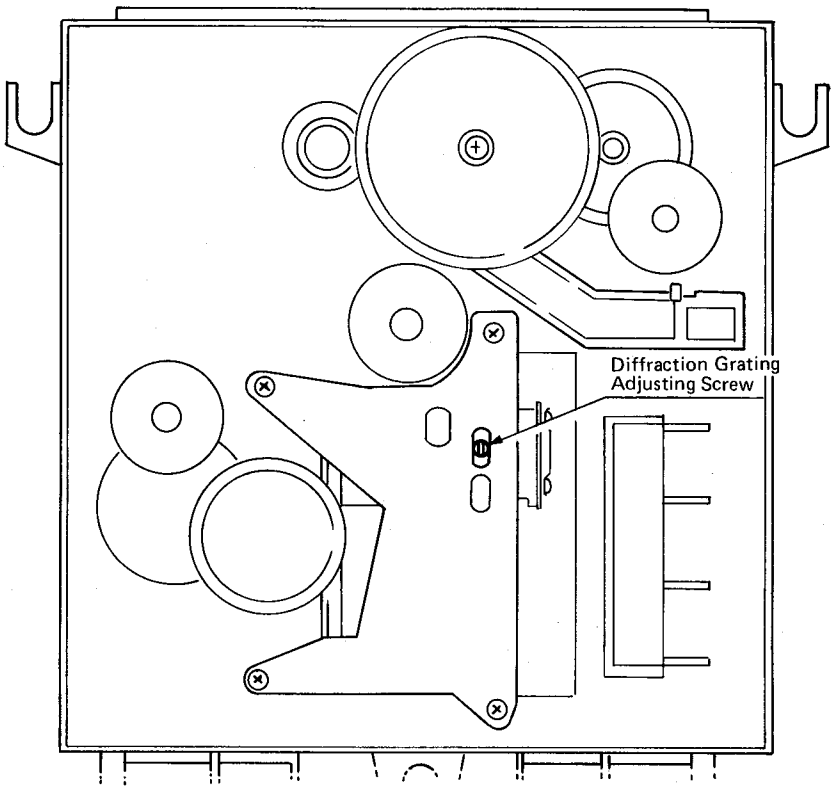
ADJUSTMENT PROCEDURE

1. Meters and Jigs

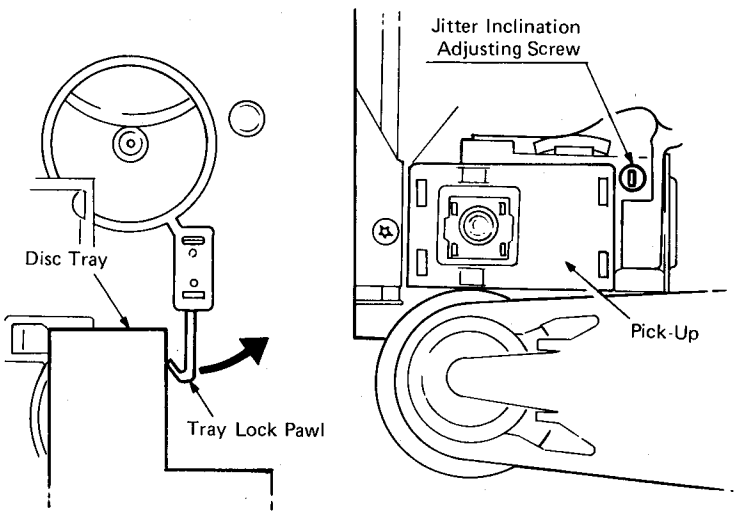
- Oscilloscope (3 or more modes, 100 MHz, X-Y input possible)
- Distortion Meter
- Test Disc
  EIAJ CD-1

2. Adjustment Points

2-1 Adjusting Screw Layout for CD Player Mechanical Assembly

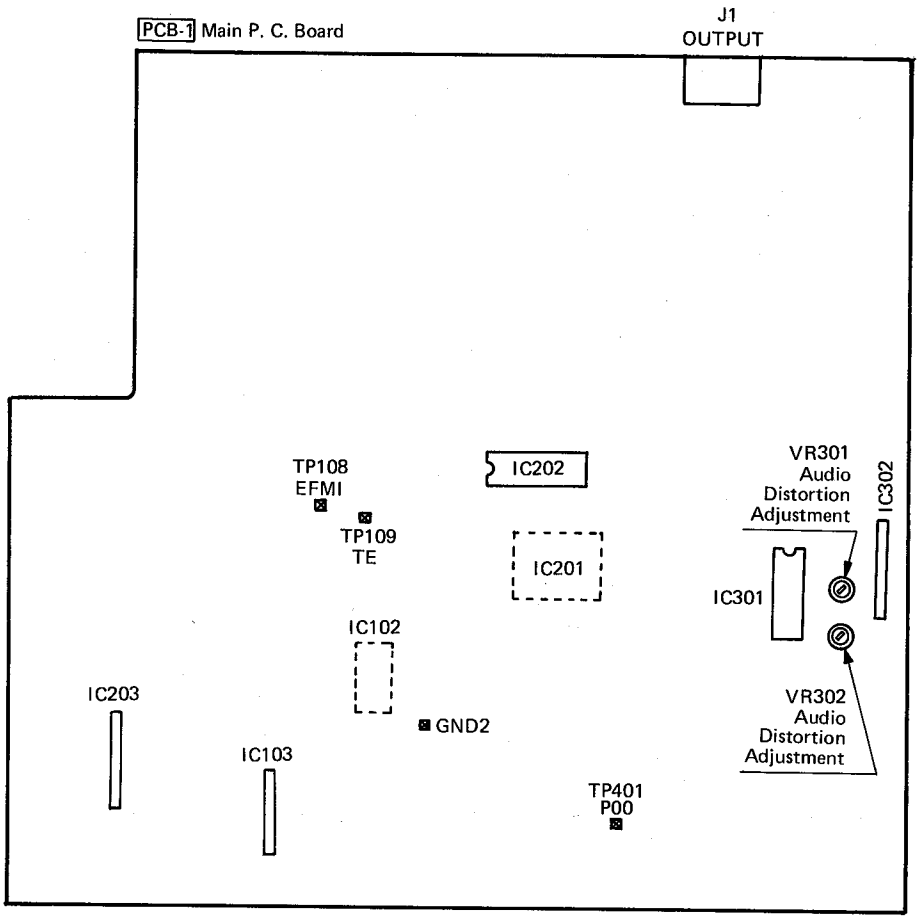


BOTTOM VIEW

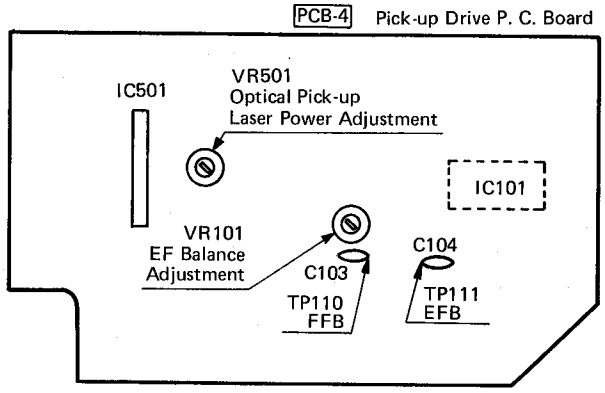


TOP VIEW AROUND PICK-UP

2-2 VR and TP Layout for Main P.C. Board



2-3 VR and TP Layout for Pick-up Drive P.C. Board



3. Test Mode

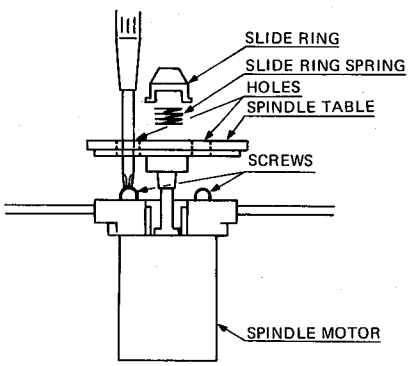
● Short-circuit TP401 and GND located on the Main P.C. Board.
Push the power switch button. (Test Mode)

Press buttons in sequence below	Test mode number	Display	Operation
POWER	0	0 TE:SF	LD OFF All servo OFF
PLAY	1	1 TE:SF	LD ON
PLAY	2	2 TE:SF	FS ON (Focus search)
PLAY (Disc must be in tray)	3	3 TE:SF	FS ON (focus ON) Disc motor rotate Mute OFF
FORWARD SKIP	4	4 TE:SF	TS (Tracking servo) ON SS (Slide servo) ON
FORWARD SKIP	5	12 3:21	Displays the track number and playback time.
REVERSE SKIP	6	3 TE:SF	TS (Tracking servo) OFF SS (Slide servo) OFF
F.F. or REVERSE SEARCH	7	———	Move the pick-up. (Manual)
STOP, then press OPEN/CLOSE	8	———	Disc tray open or close This function can be activated from stop mode.

4. Replace the Spindle Motor Assembly

(1) Remove the CD Player Mechanical Assembly.
(2) Remove the Spindle Motor Assembly. (Refer to page 7, "Disassembling the CD Player Mechanical Assembly [7].") To remove this, align the holes in the Spindle Table to the screw positions for the screw removal.
(3) Attach the new Spindle Motor Assembly to CD Player Mechanical Assembly.

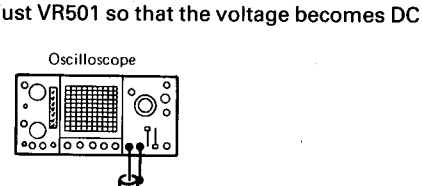
NOTE: Don't adjust the height of Spindle Table. Because its height has been already adjusted.

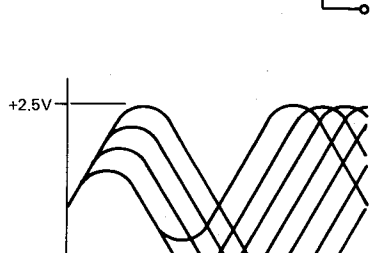


5. Adjustment of P.C. Boards

5-1 Initial Setting of Adjustment Potentiometers
Before adjusting, preset adjustment potentiometers VR101, 301, 302 and 501 for mechanical center.

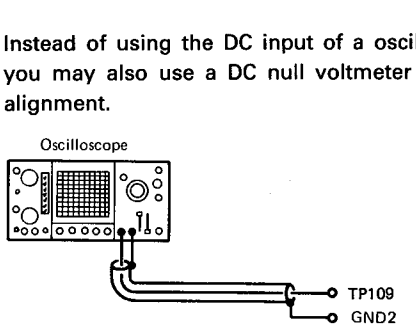
5-2 Optical Pick-up Laser Power Adjustment
(1) Connect the oscilloscope to TP108 and GND2.
(2) Insert EIAJ CD-1 test disc and place the unit in the Test Mode 1.
(3) Adjust VR501 so that the voltage becomes DC +2.5V.



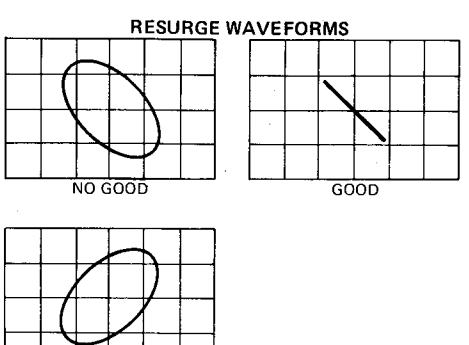


5-3 EF Balance Adjustment
(1) Connect the oscilloscope to TP109 and GND2.
(2) Insert the EIAJ CD-1 test disc and place the unit in the Test Mode 3.
(3) Adjust VR101 so that the amplitude above and below the zero DC line becomes equal. (Amplitude A = Amplitude B)

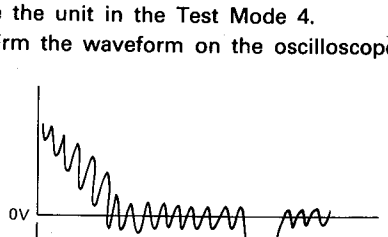
NOTE: Instead of using the DC input of a oscilloscope you may also use a DC null voltmeter for this alignment.



5-4 Diffraction Grating Adjustment
(1) Connect the oscilloscope to TP110, GND (X input) and TP111, GND (Y input).
(2) Insert the EIAJ CD-1 test disc and place the unit in the Test Mode 3.
(3) Observe the resurge waveforms on the oscilloscope, and adjust the diffraction grating screw so that the phase difference of outputs X and Y is 180°.

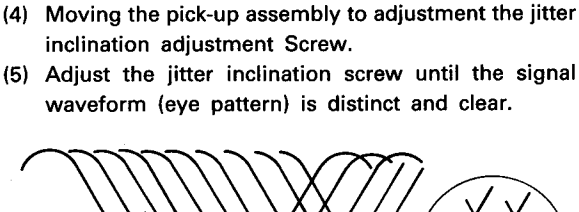


(4) Connect the oscilloscope to TP109 and GND.
(5) Place the unit in the Test Mode 4.
(6) Confirm the waveform on the oscilloscope.



(7) Repeat steps 1 through 6 for optimum sensitivity.

5-5 Jitter Inclination Adjustment
(1) Remove the Disc Tray. (Refer to "Disassembling The CD Player Mechanical Assembly" on page 7)
(2) Connect the oscilloscope to TP108 and GND2.
(3) Insert the EIAJ CD-1 test disc and place the unit in the Test Mode 4.
(4) Moving the pick-up assembly to adjustment the jitter inclination adjustment Screw.
(5) Adjust the jitter inclination screw until the signal waveform (eye pattern) is distinct and clear.

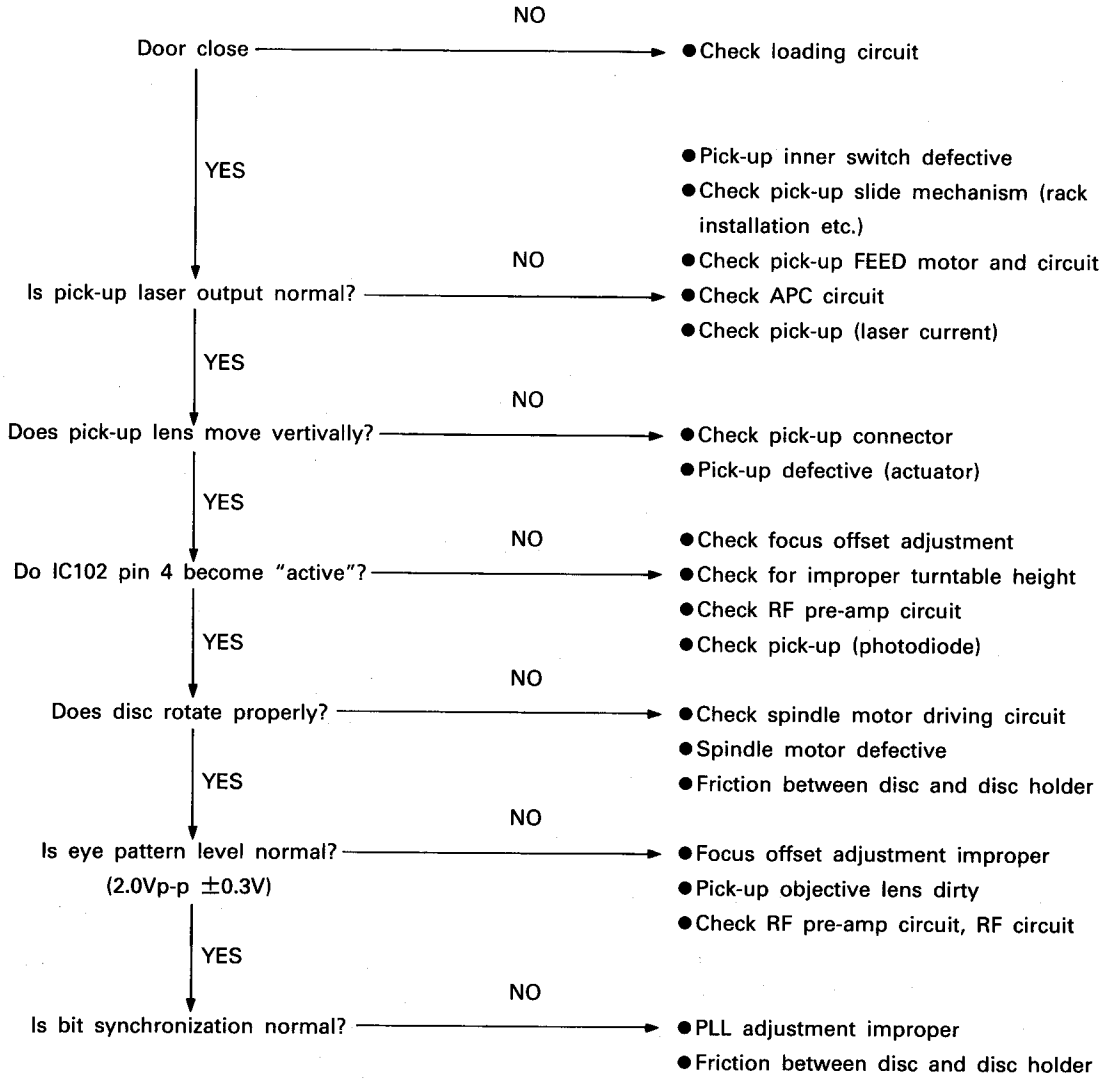


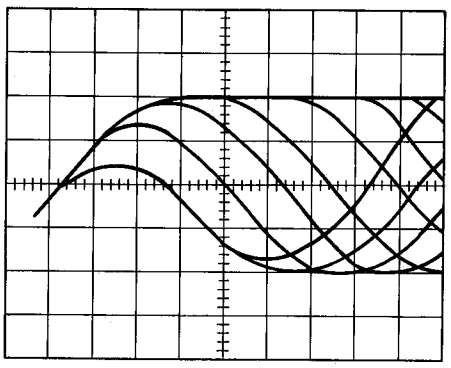
NOTE: Repeat Diffraction Grating Adjustment and Jitter Inclination Adjustment for optimum sensitivity.

5-6 Audio Distortion Adjustment
(1) Connect the distortion meter to Output jacks (J1).
(2) Insert the EIAJ CD-1 test disc and place the unit in the play mode on track number 1.
(3) Adjust VR301 and VR302 each so that the distortion is minimized.

TROUBLE SHOOTING

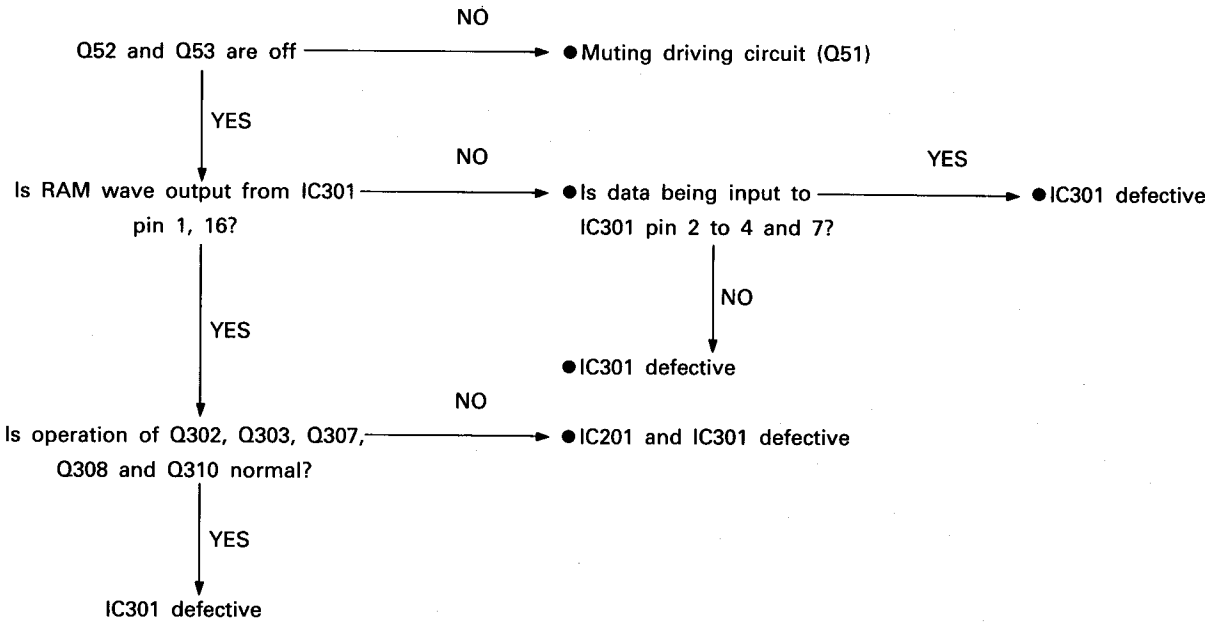
1. Does not initialize

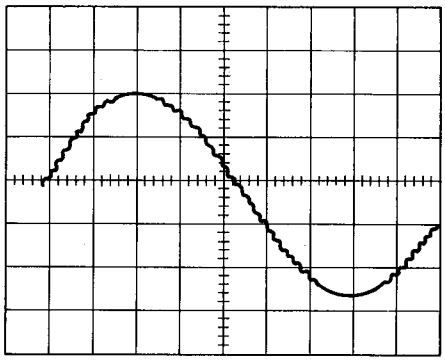




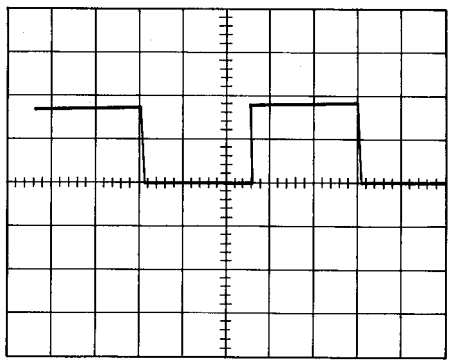
Eye Pattern (TP108)

2. No sound is produced





RAM Waveform (Pin 1 and 16 of IC301)
(Test Disc: EIAJ CD-1,1st selection)



IC301 Pin 4 Waveform
(Test Disc: EIAJ CD-1,1st selection)

3. IC Terminal Functions

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC102	1	TE IN	Pre. amp. input	I	Tracking error signal input terminal
	2	TC IN	Pre. amp. input	I	Track cross signal input terminal
	3	SHOCK IN	Pre. amp. input	I	Shock detection circuit input terminal
	4	HF OK	Pre. amp. input	I	HF OK signal input
	5	MR	Pre. amp. input	I	Disc mirror surface detection signal input signal terminal
	6	Jump Flag	Mi-com I/O	O	Outputs "1" in jump mode, e.g. TS OFF, JFJR, BRAKE.
	7	$\overline{\text{HFD}}$	Mi-com I/O	O	"1" indicates that MR input is "1" and track servo loop is off (TS OFF, JF, JR).
	8	T·HLD	Track servo	I	Direct control terminal for TS1 switch. "1" indicates that TS1 switch is "b". "0" indicates that priority is given to controller command.
	9	DATAOUT	Mi-com I/O	O	Outputs internal state corresponding to microcomputer command.
	10	$\overline{\text{JP1}}$	Mi-com I/O	I	1 track jump control signal. Normally "1".
	11	MSD	Mi-com I/O	I	Microcomputer serial data. Transfers serial data from microcomputer to servo IC. LSB forced. 8-bit data.
	12	$\overline{\text{MLA}}$	Mi-com I/O	I	Latches serial data from microcomputer to servo IC. Transfers data on trailing edge.
	13	MCK	Mi-com I/O	I	Clock for transferring serial data from microcomputer to servo IC. Receives data on leading edge.
	14	$\overline{\text{ACLR}}$	Mi-com I/O	I	All clear. Clears all internal register flip-flops. Resets when "0" signal is given.
	15	Bias	Power supply	O	Vcc/2 bias power supply output when single-pole power supply is used.
	16	COM	Power supply	I	Common terminal. Connect to GND when double-pole power supply is used and to BIAS when single-pole power supply is used.
	17	GND	Power supply	I	GND terminal.
	18	V_{EE}	Power supply	I	Negative power terminal. Connect to GND when single-pole power supply is used.
	19	SS OUT	Slide servo	O	Operation amplifier SS output
	20	SS ⊖	Slide servo	I	Operation amplifier SS reverse input

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC102	21	SS ⊕	Slide servo	I	Operation amplifier SS non-reverse input
	22	TS OUT	Track servo	O	Operation amplifier TA output
	23	TS ⊖	Track servo	I	Operation amplifier TA reverse input
	24	TG2	Track servo	—	Track gain select switch TG2 output. Set to open or common level.
	25	TS ⊕	Track servo	I	Operation amplifier TA non-reverse input
	26	TG1	Track servo	—	Track gain select switch TG1 output. Set to open or common level.
	27	TE OUT	Track servo	O	Operation amplifier TE output
	28	TE ⊖	Track servo	I	Operation amplifier TE reverse input
	29	FSR IN	Focus servo	I	Focus search voltage level detector input
	30	FS OUT	Focus servo	O	Operation amplifier FA output
	31	FS ⊖	Focus servo	I	Operation amplifier FA reverse input
	32	FS ⊕	Focus servo	I	Operation amplifier FA non-reverse input
	33	FG	Focus servo	—	Focus gain select switch FG output. Set to open or common level.
	34	C-FSR	Focus servo	—	Connect capacitor which determines time constant of focus search waveform.
	35	I-Ref	Power supply	I	Terminal for connecting resistor for setting current value of reference current source.
	36	Vcc	Power supply	I	Positive power terminal
IC201	1	DWDCK		O	D-A converter mode 3 word clock
	2	NC		—	
	3	EMP		O	Emphasis code output. "1" indicates emphasis.
	4	PWM_1		O	Disc motor drive PWM output 1. −
	5	PWM_2		O	Disc motor drive PWM output 2. +
	6	TEST		I	Test mode select input. Normally "0" indicates play.

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC201	7	$DASEL_1$		I	D-A interface control input 1
	8	DFPAS		I	Digital filter control input. "1" indicates digital filter pass.
	9	$DASEL_2$		I	D-A interface control input 2
	10	MSD		I	Microcomputer interface serial data input
	11	MCK		I	Microcomputer interface shift clock input
	12	$\overline{MLA}$		I	Microcomputer interface data latch clock input
	13	$\overline{ACLR}$		I	Microcomputer interface register clear input. "0" indicates that register has been cleared and MUTE, S/S, BCON set to "0".
	14	$\overline{HFD}$		I	Play signal absence signal input
	15	HF		I	Play signal input
	16	IREF		I	Detection/PLL circuit reference current input
	17	TLC		O	Slice level control output
	18	LPF		I/O	PLL loop filter connection terminal
	19	SYCLK		O	Frame synchronous state output. "1" indicates synchronization.
	20	V_{DD2}		I	5V power supply used for detection/PLL circuit analog area only
	21	NC		—	
	22	DRD		O	Low disc circuit state output
	23	EFFK		O	EFM frame clock output. Duty = approx. 50%.
	24	SCOR		O	Sub-code synchronous signal output. S0 + S1.
	25	CRCF		O	Sub-code Q CRC check result output. "1" indicates CRCOK.
	26	SCCK		I	Shift clock input for sub-code serial output
	27	$SCOE_2$		I	Sub-code parallel output channel P to S enable input. "0" indicates high impedance.
	28	$SCOE_1$		I	Sub-code parallel output channel T to W enable input. "0" indicates high impedance.
	29	V_{SS2}		I	GND. Same potential as VSS1.
	30	SBCW		O	Sub-code channel W output
	31	SBCV		O	Sub-code channel V output
	32	SBCU		O	Sub-code channel U output
	33	SBCT		O	Sub-code channel T output

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
	34	SBCS		O	Sub-code channel S output
	35	SBCR		O	Sub-code channel R output
	36	SBCQ		O	Sub-code channel Q output
	37	SBCP		O	Sub-code channel P output
	38	$\overline{RAS}$		O	Row address strobe signal output
	39	NC		—	
	40	RDB_2		I/O	External memory data I/O 2
	41	NC		—	
	42	RDB_1		I/O	External memory data I/O 1
	43	RDB_4		I/O	External memory data I/O 4
	44	$\overline{CAS}$		O	Column address strobe signal output
	45	RDB_3		I/O	External memory data I/O 3
	46	$\overline{WE}$		O	Write enable signal output
	47	NC		—	
IC201	48	RAD_1		O	External memory address output 1
	49	RAD_2		O	External memory address output 2
	50	RAD_3		O	External memory address output 3
	51	RAD_7		O	External memory address output 7
	52	RAD_4		O	External memory address output 4
	53	RAD_5		O	External memory address output 5
	54	RAD_6		O	External memory address output 6
	55	RAD_0		O	External memory address output 0
	56	V_{DD1}		I	5V power supply
	57	EST_2		O	Error status 2. "1" indicates detection of data which cannot be corrected by C2 decoder.
	58	EST_1		O	Error status 1. "1" indicates detection of C1 decoder error.
	59	C846		O	Clock output. 8.4672MHz.
	60	C423		O	Clock output. 4.2336MHz. Duty = 50%.
	61	C16MI		I	1/2 divider input. With built-in feedback resistor for generating 1/2 VDD bias voltage.

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC201	62	C8MO		O	1/2 divider output
	63	X_I		I	Quartz oscillator input. External clock may be input. With built-in feedback resistor.
	64	X_O		O	Quartz oscillator output
	65	V_{SS1}		I	GND. Same potential as VSS2.
	66	DOFK		O	OSC frame clock output. 7.35kHz. Duty = 50%.
	67	DO		O	D-A converter serial data output
	68	NC		—	
	69	WDCK		O	D-A converter word clock or APTL
	70	LRCK		O	D-A converter left/right clock or APTR
	71	NC		—	
	72	DSCK		O	D-A converter data shift clock
IC202	1	$\overline{OE}$		I	Output enable input
	2	DQ1		I/O	Data I/O
	3	DQ2		I/O	Data I/O
	4	$\overline{W}$		I	Write designation input
	5	$\overline{RAS}$		I	Row address strobe input
	6	A6		I	Address input
	7	A5		I	Address input
	8	A4		I	Address input
	9	V_{CC}		—	Power supply (5V)
	10	A7		I	Address input (row address only)
	11	A3		I	Address input
	12	A2		I	Address input
	13	A1		I	Address input
	14	A0		I	Address input (row address only)
	15	DQ3		I/O	Data I/O
	16	$\overline{CAS}$		I	Column address strobe input
	17	DQ4		I/O	Data I/O
	18	V_{SS}		—	Power supply (0V)

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC301	1	CH1	V_{OUT} CH1	O	Sample hold analog switch output for CH1
	2	SMP1	SMP1	I	Interval "1" becomes sampling time for CH1.
	3	SMP2	SMP2	I	Interval "1" becomes sampling time for CH2. The internal signal for latching serial data is produced by using SMP1 and SMP2 fall. The longer the SMP1 and SMP2 time is, the more improved the level frequency response is.
	4	SD	SD	I	Serial input of digital signal to be converted
	5	FORM SELECT	FORM SELECT	I	Capable of processing binary input format at "1" and 2's complement input format at "0".
	6	V_{SS}	V_{SS}	—	Low electric potential side power source (GND)
	7	CLOCK	CLOCK	I	Clock to operate shift register and timing generator (ϕ4)
	8	V_{DD}	V_{DD}	—	High electric potential side standard power source
	9	V_{SS}	V_{SS}	—	Low electric potential side standard power source (GND)
	10	RBH	RBH	O	As the same resistor is used between the RBH pin and internal V_{DD} power source and between the RBL pin and internal V_{SS} (GND) power source, connecting both pins will provide highly accurate 1/2 V_{DD} voltage. The voltage is applied to the MP pin through the buffer operational amplifier.
	11	RBL	RBL	O	As shown in the standard circuit example, deviation from the 1/2 V_{DD} can be corrected by adding a suitable resister externally.
	12	MP	MP	I	Exponential analog shift is carried out with the electric potential applied to the MP as a standard. Normally it is biased to the 1/2 V_{DD}.
	13	To BUFF	To BUFF	O	DAC analog output, input to the buffer operational amplifier
	14	COM	COM	I	Common input to analog switches for CH1 and CH2
	15	$\overline{ICL}$	$\overline{ICL}$	I	The signal "1" - normal operation and "0" - zero signal operation regardless of the signal SD.
	16	CH2	CH2	O	Sample hold analog switch output for CH2
IC401	1	P27	OPEN	I/O	Disc tray opening direction driving output
	2	P26	CLOSE	I/O	Disc tray closing direction driving output
	3	P25	JP1	I/O	
	4	P24	MSD	I/O	Serial data output
	5	P23	MCK	I/O	Shift clock output
	6	P22	MLA	I/O	Data latch clock output
	7	P21	MUTE	I/O	Mute output
	8	P20	ACK	I/O	

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
	9	NC	NC	—	
	10	P07	DATA IN	I/O	Serial data input
	11	P06	SYCLK	I/O	Frame synchronization signal output
	12	P05	DRD	I/O	
	13	P04	SCOR	I/O	Sub code synchronization signal output S0 + S1
	14	P03	CRCF	I/O	Sub code Q CRCOK = 1
	15	P02	SUBQ	I/O	Sub code Q Channel output
	16	P01	KD4	I/O	
	17	P00	TEST	I/O	
	18	$\overline{INT2}$	STB	I	
	19	$\overline{INT1}$	EFFK	I	EFM frame clock output
	20	NC	NC	—	
IC401	21	CNVss	GND	—	CNVss input
	22	$\overline{RESET}$	RESET	I	Reset input
	23	XIN	XIN	I	Clock input
	24	XOUTF	XOUTF	O	Clock output F
	25	XOUTS	XOUTS	O	Clock output S
	26	Vss	GND	—	Power supply
	27	XCIN	DATA IN	I	Serial data input
	28	XCOUT	—	O	Clock output for timer
	29	R3	KD3	I	Key input 3
	30	R2	KD2	I	Key input 2
	31	R1	KD1	I	Key input 1
	32	R0	KD0	I	Key input 0
	33	ϕ	—	O	Timing output
	34	VP	VP	—	Pull down voltage input
	35	P17	LD ON	O	Laser diode control output
	36	P16	G7	O	Figure output 7
	37	P15	G6	O	Figure output 6

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC401	38	P14	G5	O	Figure output 5
	39	P13	G4	O	Figure output 4
	40	P12	G3	O	Figure output 3
	41	P11	G2	O	Figure output 2
	42	P10	G1	O	Figure output 1
	43	P37	i	O	Segment output i
	44	P36	g	O	Segment output g
	45	P35	f	O	Segment output f
	46	P34	e	O	Segment output e
	47	P33	d	O	Segment output d
	48	P32	c	O	Segment output c
	49	P31	b	O	Segment output b
	50	P30	a	O	Segment output a
	51	Vcc	Vcc	—	Power supply
	52	Vcc	Vcc	—	Power supply
IC402	1	I/O PORT D	D3	I/O	9-bit terminal having output function on an independent bit basis. Output is open drain circuit for N channel transistor. Port D0 to D3 terminals have 4-bit input function. Programming output latch to "1" sets the output to floating (high impedance) state so that the terminals may be used as input port.
	17		D0	I/O	
	18		D1	I/O	
	19		D2	I/O	
	2	OUT PORT D	D4	O	
	3		D5	O	
	6		D6	O	
	7		D7	O	
	8		D8	O	
	4	CNV_{SS} (0V)	CNV_{SS}	—	Connect to VSS. Low input (0V) must be applied.
	5	V_{SS} (0V)	V_{SS}	—	GND terminal

CIRCUIT DESCRIPTION

1. APC CIRCUIT

A semiconductor laser is used as the light source for the optical pickup. As the output from the semiconductor laser changes radically with changes in temperature, a circuit must be provided to stabilize this output. For this purpose, a monitor diode which detects the optical output of the laser diode is used in the semiconductor laser.
As the laser diode emits light from its bonded surface, light is emitted both in front and behind. The light emitted from the rear is monitored with the monitor diode installed on its rear surface, and the optical output is thus controlled. The light emitted from the front becomes the light source for the pickup.

Fig. 1 shows the APC circuit.
When the temperature rises and the optical output decreases, the monitor current (IS) decreases, the electric potential of IC501 pin 1 rises, the base current of the driving transistor increases, and the laser current increases. This causes the reduced optical power to return to its former level.

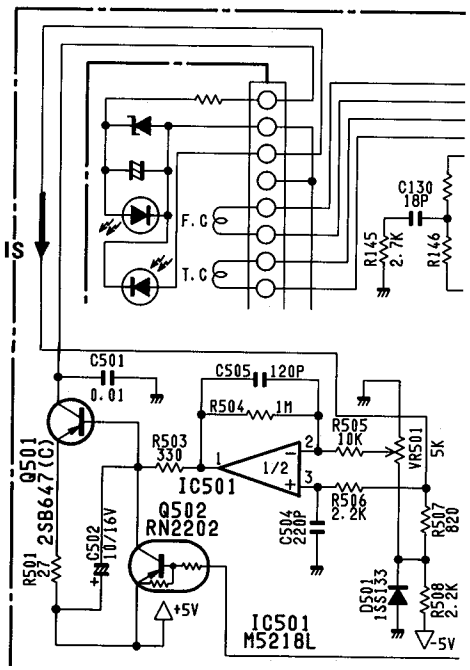
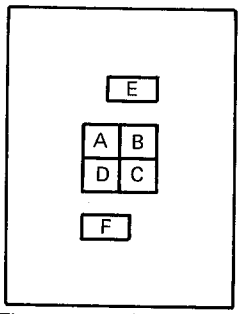


Fig. 1

2. FOCUS SERVO

2-1. Optical pickup

This set employs a three-spot optical pickup comprised of six division photodiodes, A through F. The four photodiodes at the center, i.e., (A + C) and (B + D), provide both focus error detection by means of a main beam spot and main signal pickup. The remaining two diodes, (E and F), provide tracking error detection by means of sub-beam spots.



Three spotted (six-devision) photo diodes

Fig. 2-1

2-2. Focus error detecting operation

The reflected laser beam from a disc is polarized 90° with the beam-splitter and sent to the photodiodes via the cylindrical lens. The beam passed through this cylindrical lens gradually varies its shape along its path - as an oval in a longitudinal direction, then as a circle, and-finally as an oval in a trans-verse direction. (See Fig. 2-2)
The beam shape varies with the distance from the disc, and when "just-focus" the photosensor (photo-diodes) is positioned at the center of the circular beam. The photodiode is divided into four sections, all of which provide outputs when in focus. However, when the disc it too close the longitudinal direction oval beam rays on the upper and lower photodiodes, causing only these two diodes to provide outputs, and if, on the other hand, the disc is too far only the left and right diodes provide outputs. Therefore, by amplifying the difference in output derived from these four-division diodes a focus error signal can be obtained. The focus error signal is amplified and fed to the objective lens for focus correction, thereby always maintaining an in-focus state. The focus correction is performed in the focus servo control circuit.

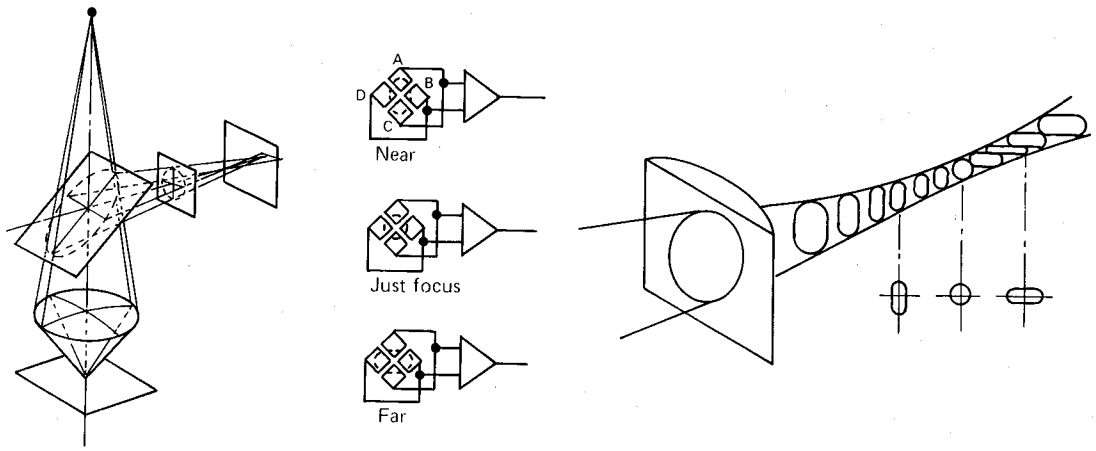


Fig. 2-2

2-3. Focus servo control operation

The optical pickup outputs, (A + C) and (B + D), are input to pin 5 and pin 6 of IC101, where the photodiode current is converted to voltage by RF-V Amplifier. The difference between (A + C) and (B + D) is derived and a focus error signal is output from pin 16 of IC101 (detection amplifier stage) in such a manner that if (A + C) > (B + D) the focus error is positive (focus too close), and if (A + C) < (B + D) the focus error is negative (focus to far).

If "near-focus" then output to pin 16 of IC101 is + voltage. And if "far focus" then output to pin 16 of IC101 is - voltage. This focus error signal input to pin 32 of IC102, after being amplified by the preamplifier (IC102). Output to pin 30. Output signal of + voltage or − voltage (pin 30 of IC102) input to pin 2 of IC103 and output to pin 8 of IC103, drives the objective lens for automatic focus correction (adjustment). (Fig. 2-3)

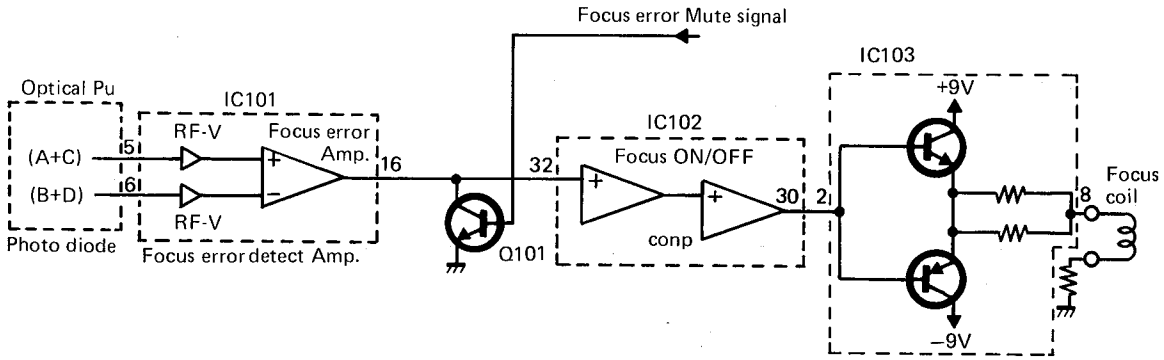


Fig. 2-3

2-4. The Tracking Error Detection System

The laser beam must follow the spiral path of the disc. The detection system employs the 3 beam system.

Fig. 2-4 illustrates the 3 beam system. Fig. 2-4-A depicts the condition under which the tracking is deemed to be correct. Two additional lights detectors (E and F), also a part of the Pick-Up Assembly, are used in the Auto Tracking circuit. When tracking is correct the amount of light reflected from the Disc for both outer beams is equal, therefore, the same amount of light is sensed by both the E and F light detectors and both detectors develop equal amplitude output voltages. The output of the E detector applied to the (−) input of an OP-AMP, and the output of the F detector is directed to the (+) input of the same OP-AMP. Since the (+) and (−) inputs are equal, the output of OP-AMP, when tracking is correct, is Ov.

Fig. 2-4-B illustrates a tracking error in one direction. In this case the E detector receiving reflected light from the mirrored surface of the Disc, receives more reflected light than the F detector, therefore, the (−) OP-AMP input receives a higher voltage than the (+) input. The OP-AMP outputs a negative Tracking Error voltage which is directed to the Tracking Servo circuit in order to make the adjustments necessary to achieve optimum tracking. Fig. 2-4-C illustrates tracking error in the opposite direction. Now the F detector receives more reflected light, the positive input of the OP-AMP is higher than the (−) input, resulting in a positive Tracking Error voltage from the OP-AMP.

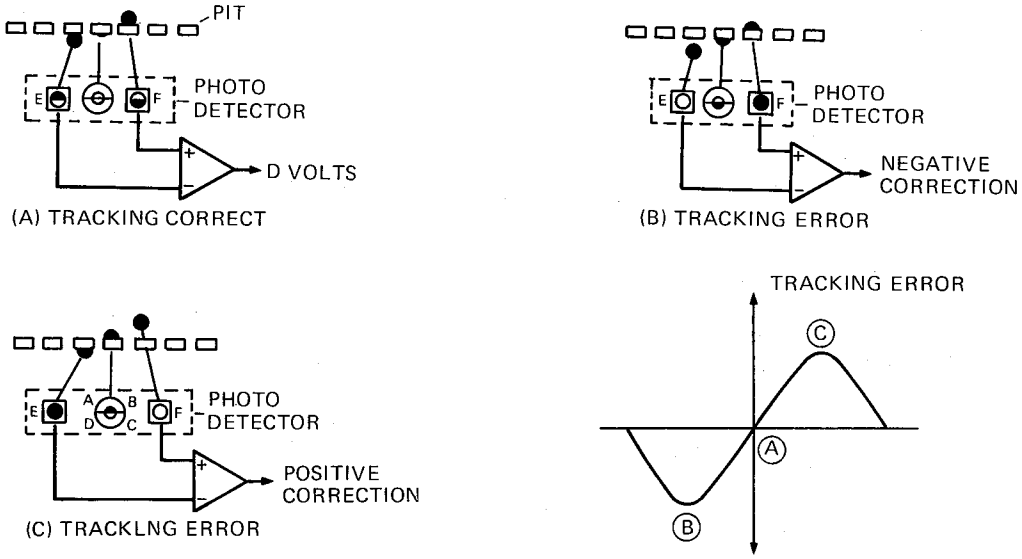
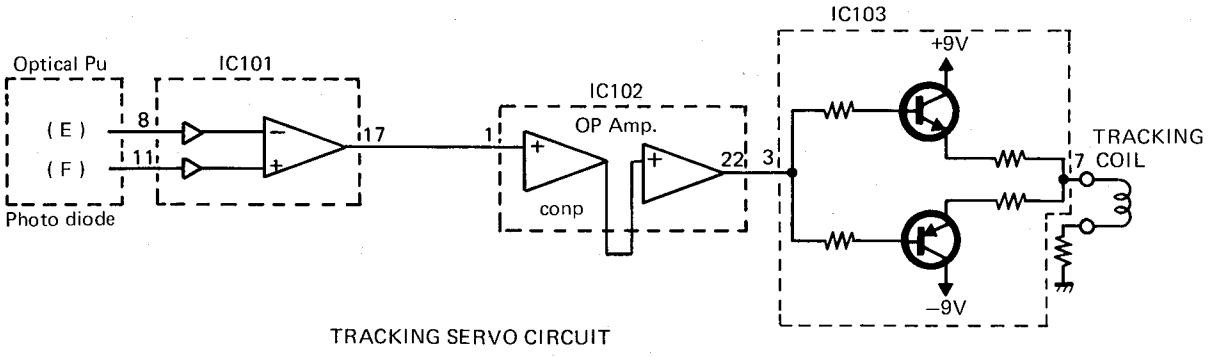


Fig. 2-4



TRACKING SERVO CIRCUIT

3. REGENERATIVE CIRCUIT

3-1. RF circuit

Photo diode current input to Pin 5 (PD1) and Pin 6 (PD2) of IC101 is converted from current to voltage by RF I-V amplifiers. Next, (A + C) and (B + D) signals are mixed in and output from pin 4 of IC101.

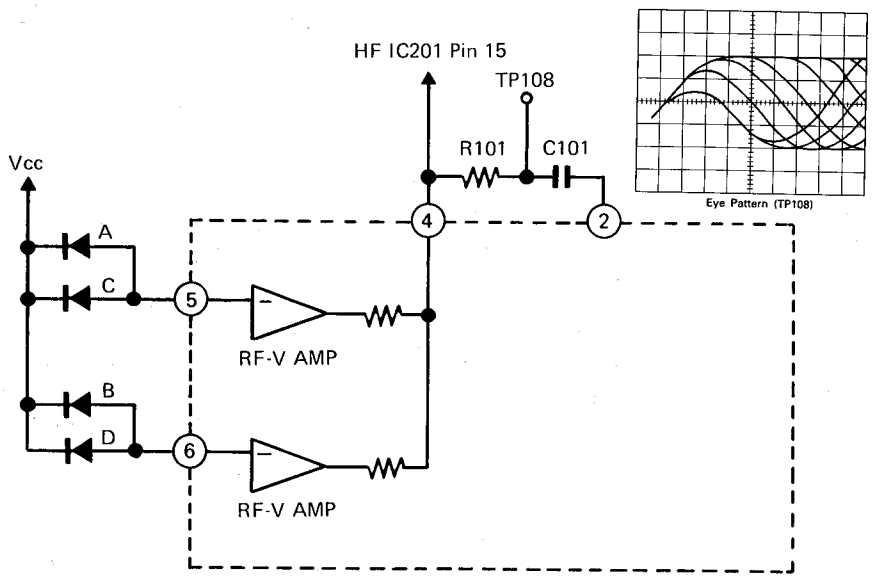


Fig. 3-1

3-2. EFM demodulation, error correction, serial/parallel conversion.

EFM demodulation, error correction and serial/parallel conversion are performed by internal circuitry of IC201. The eye-pattern signals from Pin 4 of IC101 are sent to Pin 15 of IC201, then demodulated from 14 bit into 8 bit by EFM readjustment.

If an error occurs at this point, it undergoes error correction (CIRC). The signals are then output as serial signals.

The digital signal of the CD is decoded by IC201 and then enters D/A converter (IC301), and converted from digital to analog by IC301.

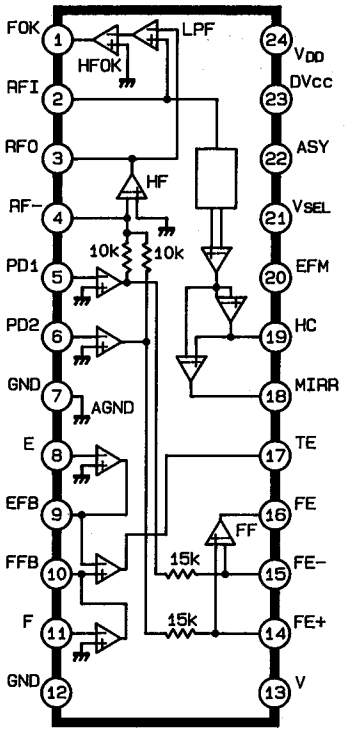
Q301, Q302, Q303 and Q304 configure a buffer circuit which prevents the D/A converter from interfering with the next LPF.

Q311 and Q312 comprise a switch driver that drives the deemphasis switch of Q309 and Q310 if an emphasis is given to the CD software by IC201.

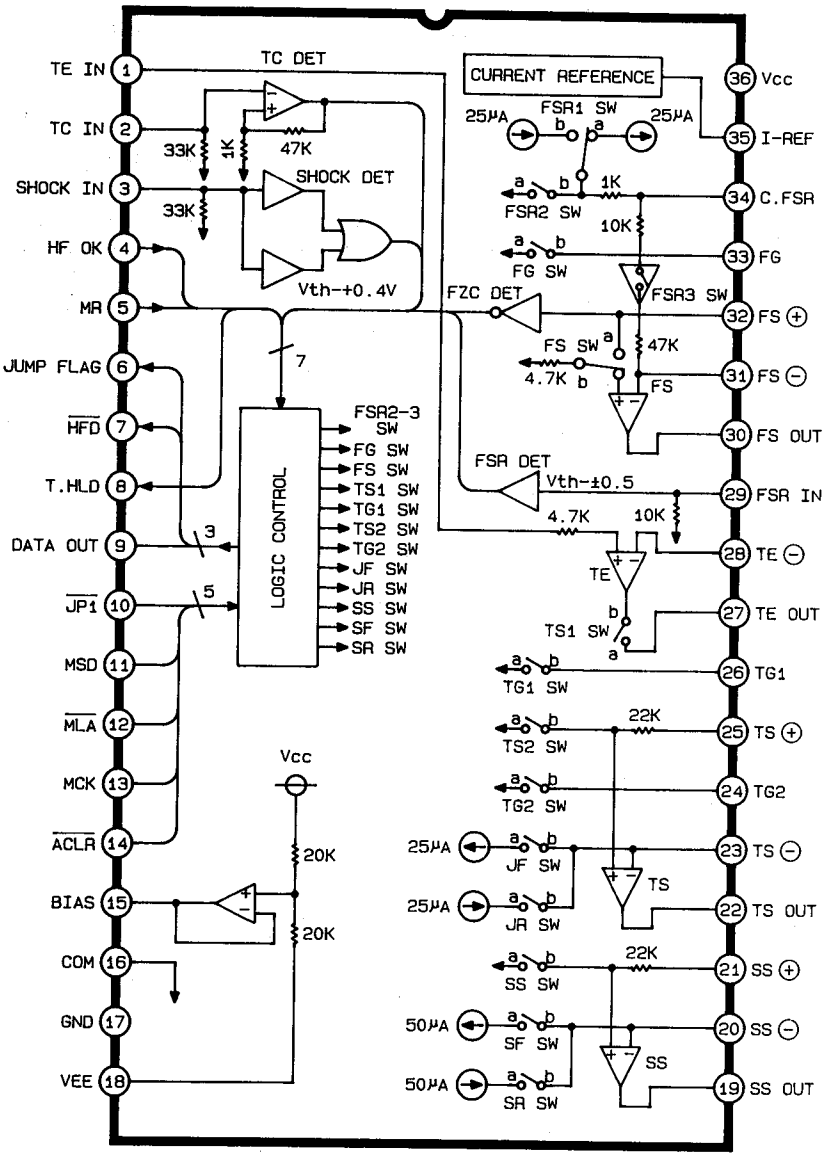
Q52 and Q53 make up a muting switch used when the power circuit is switched on.

IC BLOCK DIAGRAM

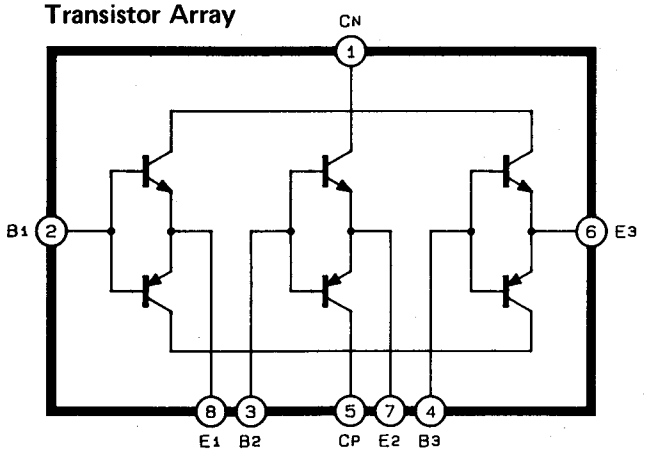
IC101
CX20109
RF Pre Amplifier



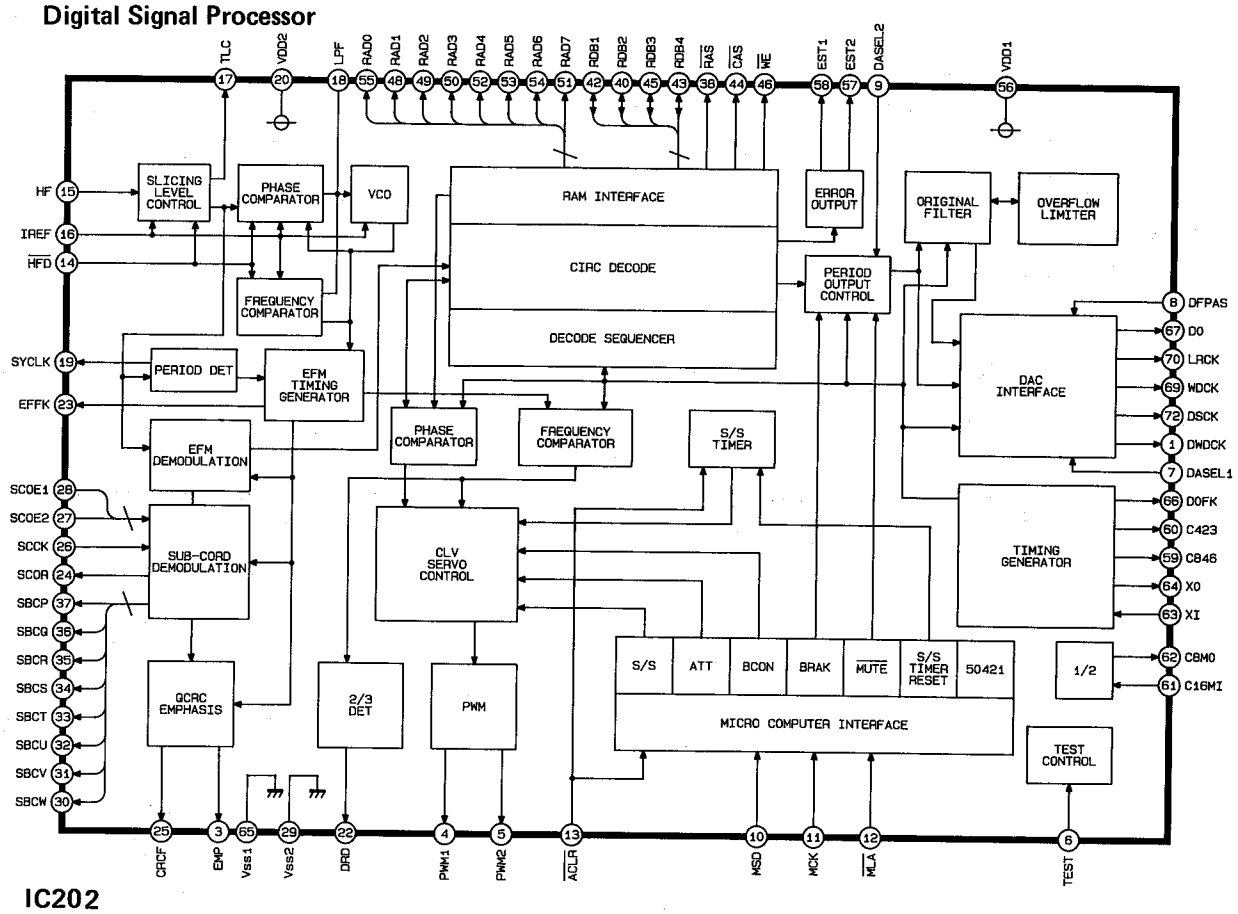
IC102
M51564P
Optical Pick-up Servo Control



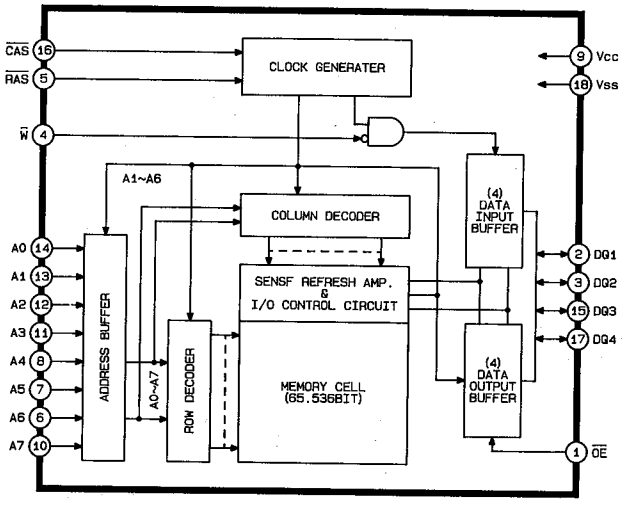
IC103
STA341M
Transistor Array



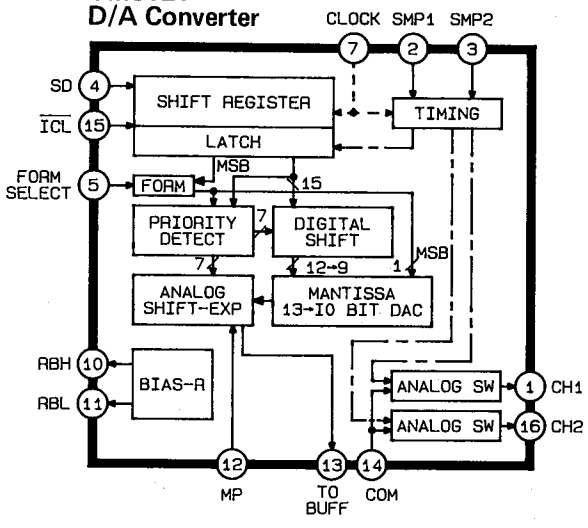
IC201
M50422P
Digital Signal Processor



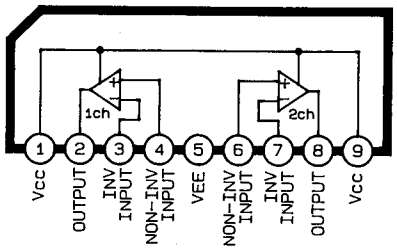
IC202
M5M4416P
65636-Bit (16384-Word by 4-Bit)
Dynamic RAM

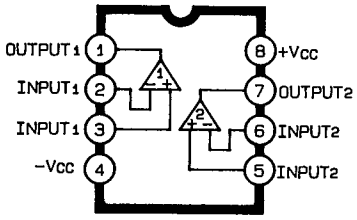


IC301
YM3020
D/A Converter



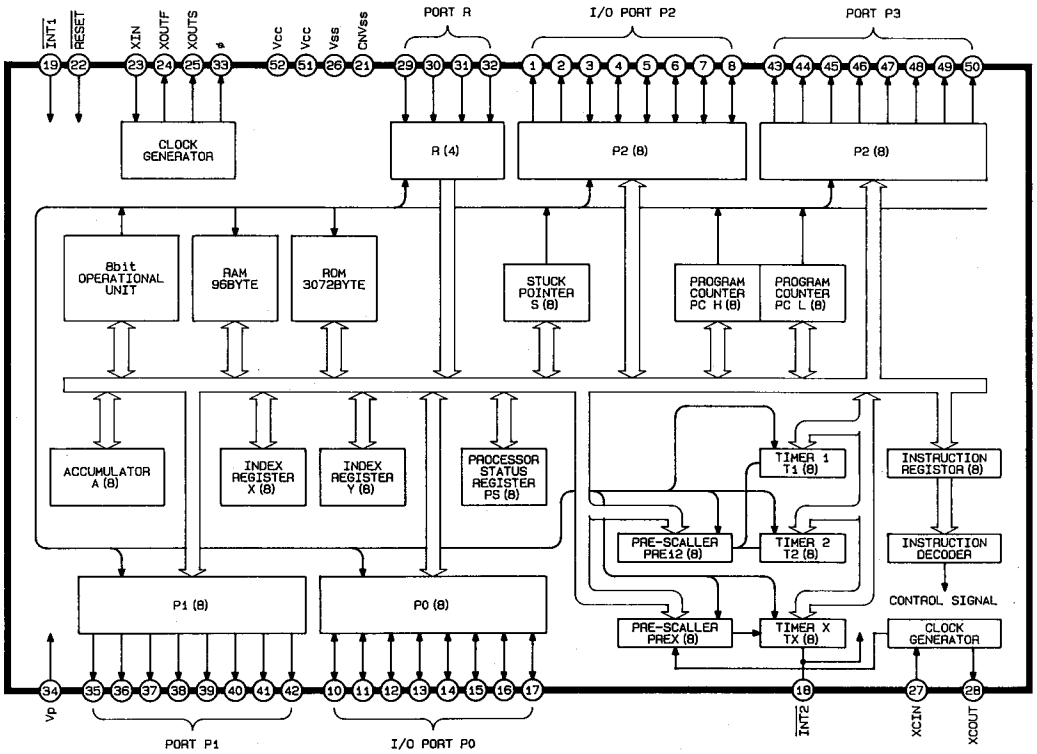
IC203
BA715
Dual Operation Amplifier



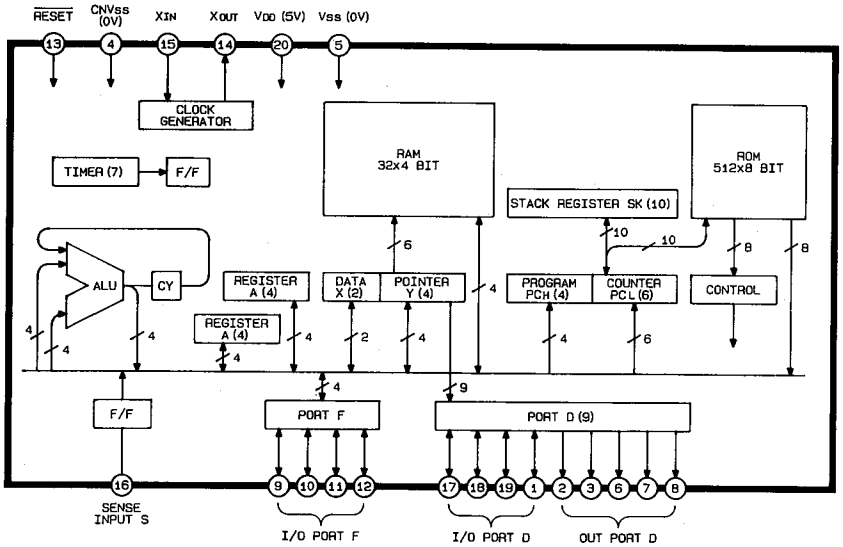


IC302
NJM4560SB
Dual Operational Amplifier

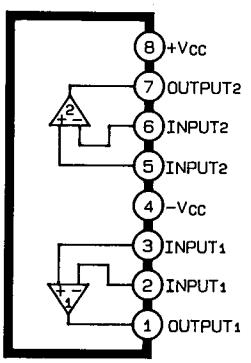
IC401
M50752-402SP
Microcomputer



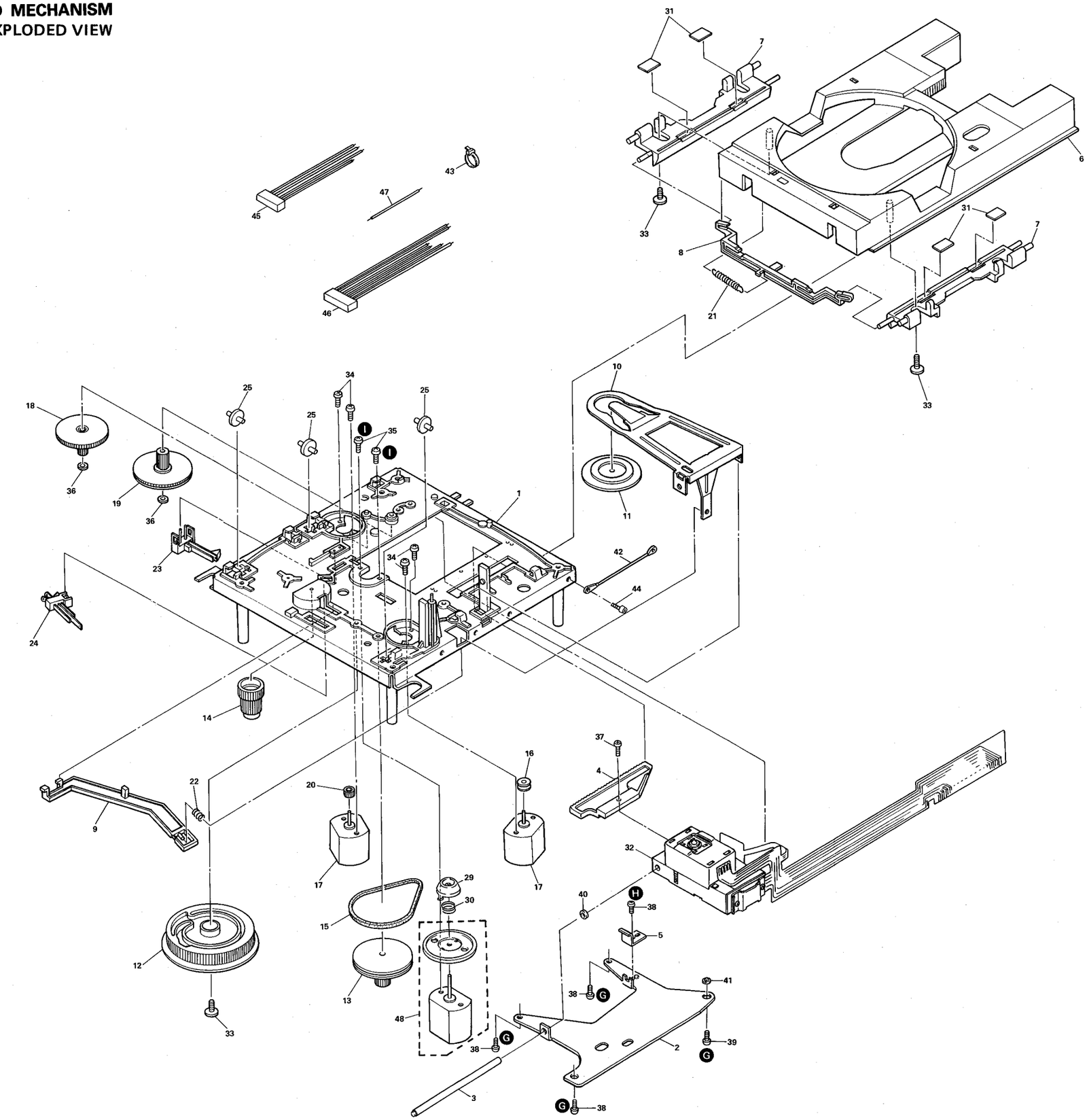
IC402
M50761-430P
Microcomputer



IC501
M5218L
Dual Operational Amplifier



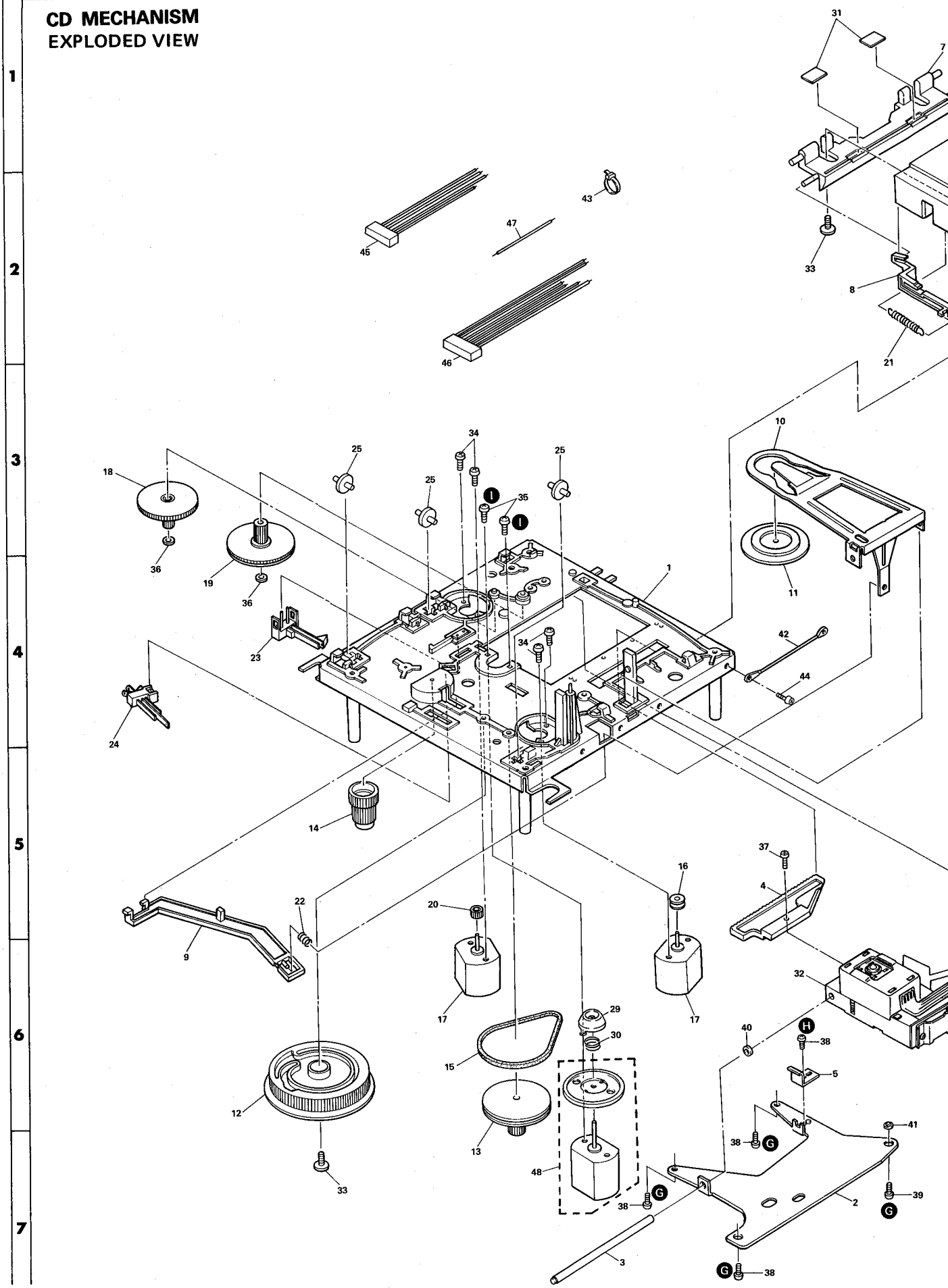
CD MECHANISM
EXPLODED VIEW

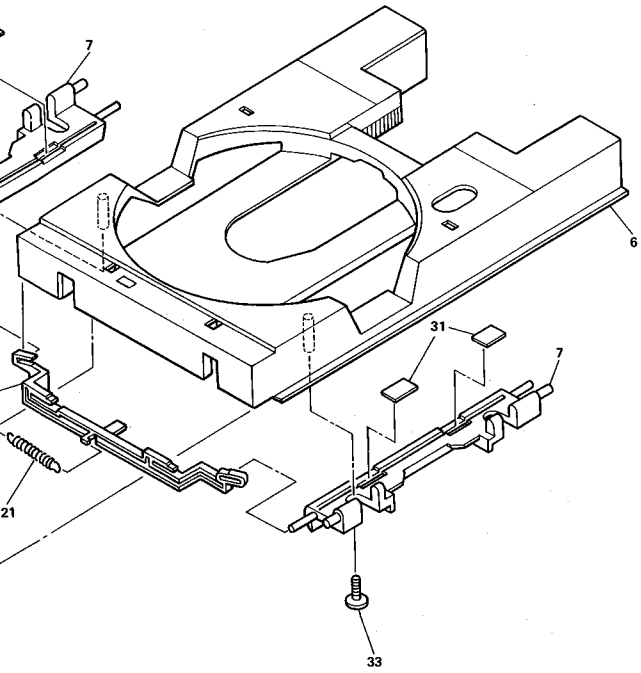


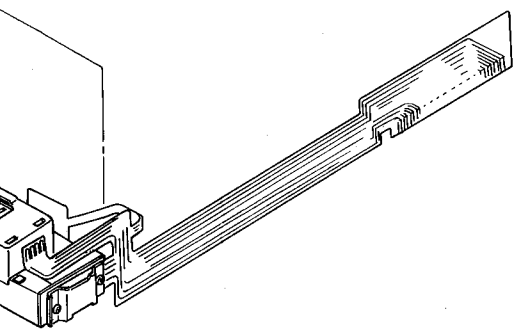
PARTS LIST

Ref. No.	Part No.	Description
1	A81A189	CHASSIS ASS'Y
2	A81P203	PICK-UP BASE ASS'Y
3	A81H023	PICK-UP BASE SHAFT
4	A81G079	PICK-UP GEAR
5	A81P018	PICK-UP BASE SHAFT HOLDER
6	A81G236	DISC TRAY
7	A81G002	TABLE
8	A81G003	SLIDER
9	A81G507	LOCK LEVER
10	A81P004	CHUCK ARM
11	A81G004	DISK HOLDER
12	A81G005	LOADING CAM
13	A81G006	LOADING GEAR A
14	A81G007	LOADING GEAR B
15	A81G070	LOADING BELT
16	A81G235	MOTOR PULLEY
17	M01T061	MOTOR, LOADING SLIDER
18	A81G008	PICK-UP GEAR A
19	A81G009	PICK-UP GEAR B
20	A81G010	MOTOR GEAR
21	A81S001	TABLE UP SPRING
22	A81S002	CHUCK ARM SPRING
23	S01W050	LEAF SWITCH
24	S01W051	LEAF SWITCH
25	A81G023	GUIDE ROLLER
29	A81G012	SLIDE RING
30	A81S013	SLIDE RING SPRING
31	A81P051	DISK GUARD
32	A81G576	PICK-UP
33	A81H005	SCREW (M3 x 8 mm)
34	M20B003	SCREW (M2 x 3 mm)
35	M20S006	SCREW (M2 x 6 mm)
36	P16C325	WASHER (1.6ϕ x 3.2ϕ x 0.25 mm)
37	B20B004	SCREW (M2 x 4 mm)
38	B26T005	SCREW (M2.6 x 5 mm)
39	P26B005	SCREW (M2.6 x 6 mm)
40	P31W805	WASHER (3.1ϕ x 8ϕ x 0.5 mm)
41	P41W825	WASHER (4.1ϕ x 8ϕ x 0.25 mm)
42	A81B395	EARTH LEAD WIRE (W/LUG 3)
43	M01N035	BAND
44	M30T005	SCREW (M3 x 5 mm)
45	A81G327	CONNECTOR WITH LEAD WIRE
46	A81G328	CONNECTOR WITH LEAD WIRE
47	A81G317	LEAD WIRE
48	A81A214	SPINDLE MOTOR ASS'Y

CD MECHANISM
EXPLODED VIEW







PARTS LIST

Ref. No.	Part No.	Description
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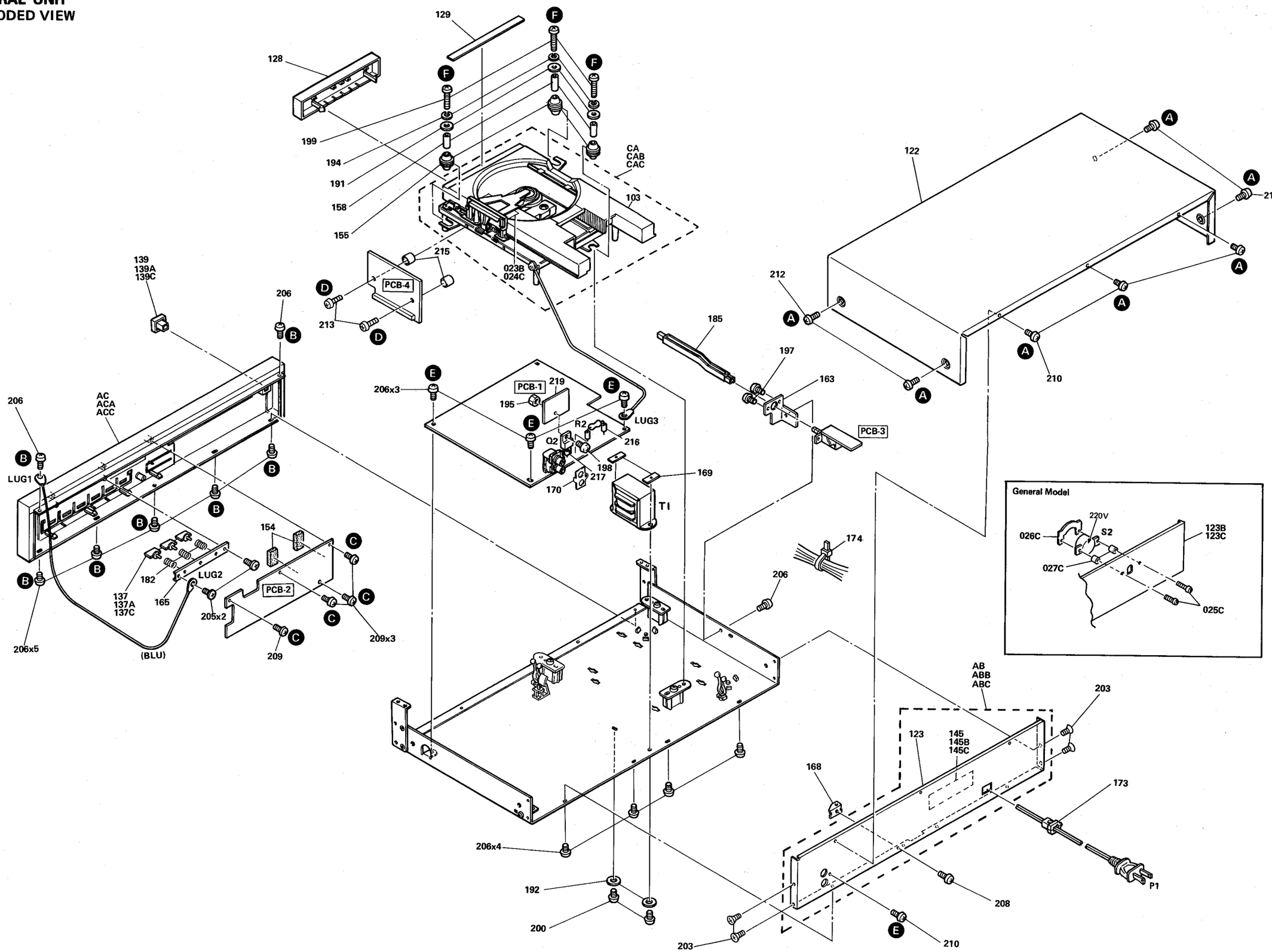
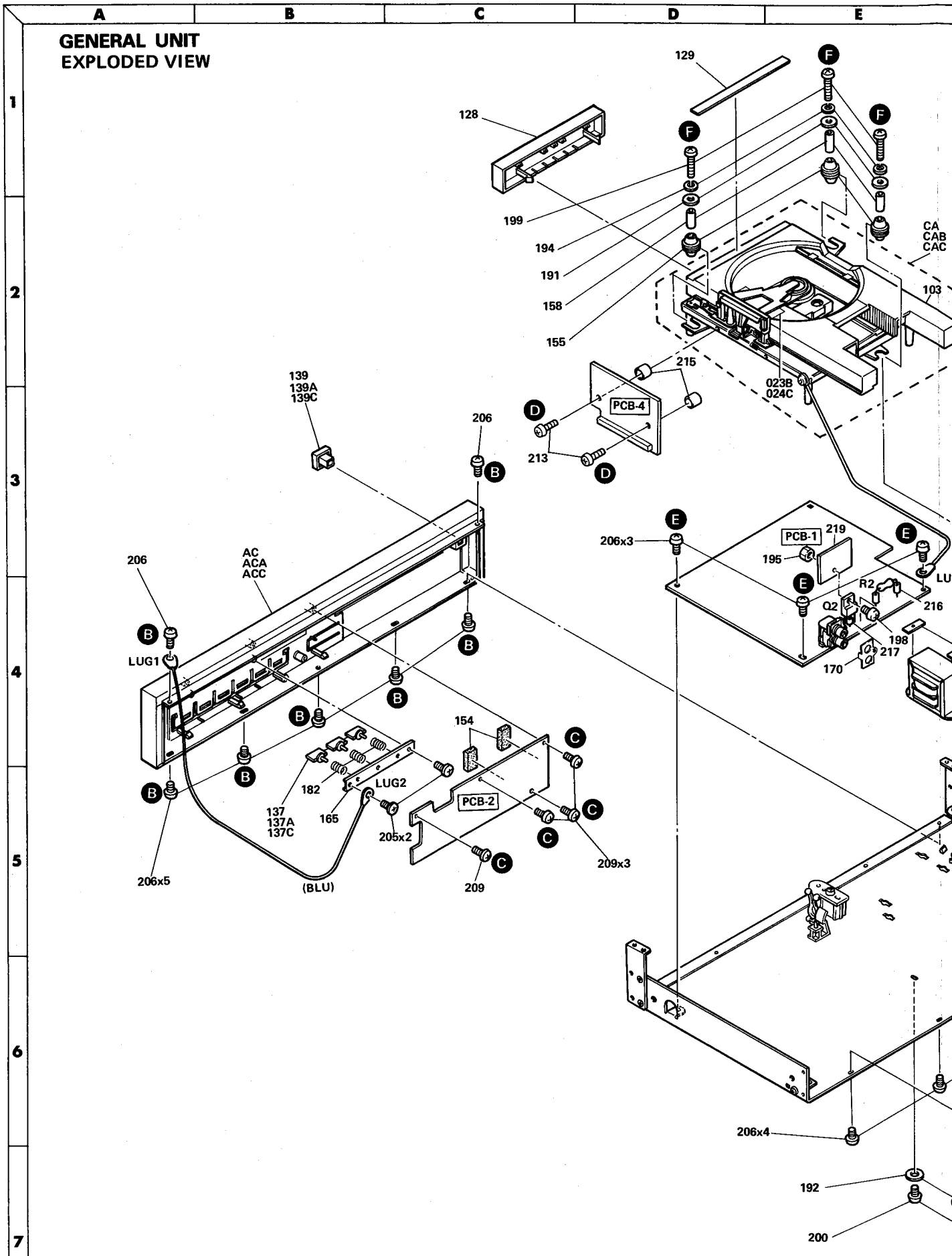
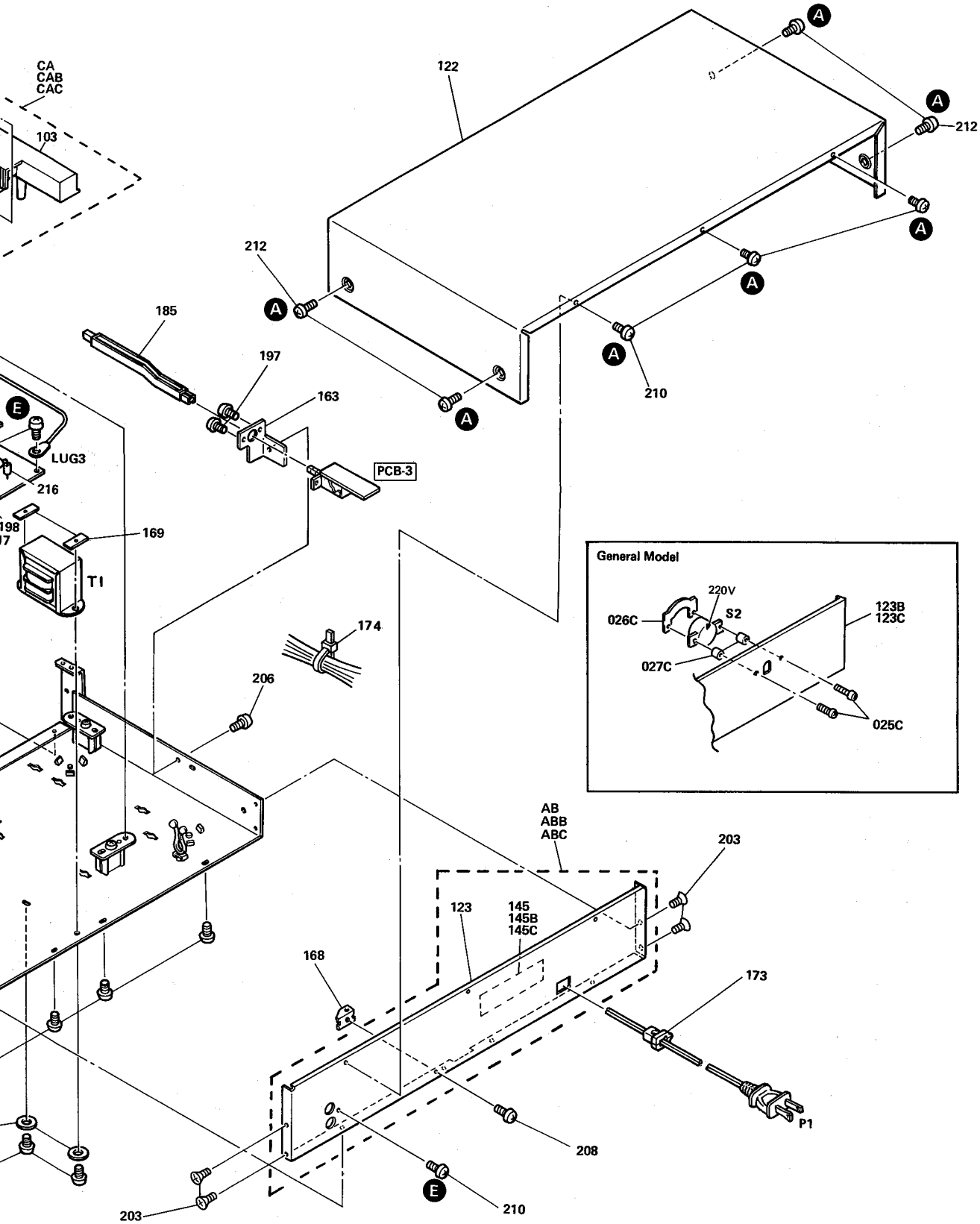
2	A81P203	PICK-UP BASE ASS'Y
3	A81H023	PICK-UP BASE SHAFT
4	A81G079	PICK-UP GEAR
5	A81P018	PICK-UP BASE SHAFT HOLDER
6	A81G236	DISC TRAY
7	A81G002	TABLE
8	A81G003	SLIDER
9	A81G507	LOCK LEVER
10	A81P004	CHUCK ARM
11	A81G004	DISK HOLDER
12	A81G005	LOADING CAM
13	A81G006	LOADING GEAR A
14	A81G007	LOADING GEAR B
15	A81G070	LOADING BELT
16	A81G235	MOTOR PULLEY
17	M01T061	MOTOR, LOADING SLIDER
18	A81G008	PICK-UP GEAR A
19	A81G009	PICK-UP GEAR B
20	A81G010	MOTOR GEAR
21	A81S001	TABLE UP SPRING
22	A81S002	CHUCK ARM SPRING
23	S01W050	LEAF SWITCH
24	S01W051	LEAF SWITCH
25	A81G023	GUIDE ROLLER
29	A81G012	SLIDE RING
30	A81S013	SLIDE RING SPRING
31	A81P051	DISK GUARD
32	A81G576	PICK-UP
33	A81H005	SCREW (M3 x 8 mm)
34	M20B003	SCREW (M2 x 3 mm)
35	M20S006	SCREW (M2 x 6 mm)
36	P16C325	WASHER (1.6ϕ x 3.2ϕ x 0.25 mm)
37	B20B004	SCREW (M2 x 4 mm)
38	B26T005	SCREW (M2.6 x 5 mm)
39	P26B005	SCREW (M2.6 x 6 mm)
40	P31W805	WASHER (3.1ϕ x 8ϕ x 0.5 mm)
41	P41W825	WASHER (4.1ϕ x 8ϕ x 0.25 mm)
42	A81B395	EARTH LEAD WIRE (W/LUG 3)
43	M01N035	BAND
44	M30T005	SCREW (M3 x 5 mm)
45	A81G327	CONNECTOR WITH LEAD WIRE
46	A81G328	CONNECTOR WITH LEAD WIRE
47	A81G317	LEAD WIRE
48	A81A214	SPINDLE MOTOR ASS'Y

GENERAL UNIT
EXPLODED VIEW



GENERAL UNIT
EXPLODED VIEW




CA
CAB
CAC
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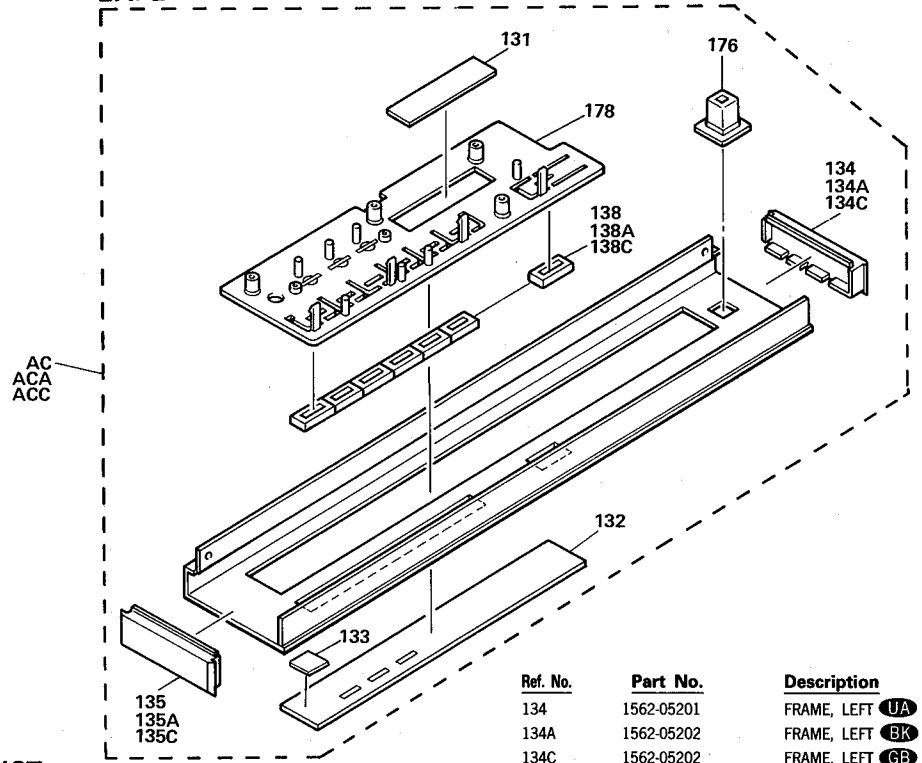
122
212
212
185
197
163
PCB-3
LUG3
216
169
T1
174
206
210
General Model
220V
S2
026C
027C
123B
123C
025C
AB
ABB
ABC
203
123
145
145B
145C
168
173
P1
208
210
203

PARTS LIST

Ref. No.	Part No.	Description
AB	A424-HD400B	CABI BACK, REAR ASS'Y (UA) (BK)
ABB	A424-HD400D	CABI BACK, REAR ASS'Y (G)
ABC	A424-HD400F	CABI BACK, REAR ASS'Y (GB)
CA	C119-HD400A	CD MECHA ASS'Y (UA) (BK)
CAB	C119-HD400B	CD MECHA ASS'Y (G)
CAC	C119-HD400C	CD MECHA ASS'Y (GB)
023B	1756-11802	LABEL (G)
024C	1756-11802	LABEL (GB)
025C	2327-301449	SCREW BND+, VOLTAGE SELECTOR (G) (GB)
026C	2440-7017	NUT SPE, VOLTAGE SELECTOR (G) (GB)
027C	2132-01406	SPACER, VOLTAGE SELECTOR (G) (GB)
103	3119-00801	CD MECHA
122	1414-09101	CABINET
123	1424-21007	CABI BACK, REAR (UA) (BK)
123B	1424-21008	CABI BACK, REAR (G)
123C	1424-21008	CABI BACK, REAR (GB)
128	1452-04701	LID, MECHA
129	1511-09701	PLATE, MECHA
137	1662-08502VN	PUSH BUTTON (UA) (G)
137A	1662-08503	PUSH BUTTON (BK)
137C	1662-08503	PUSH BUTTON (GB)
139	1662-25401VN	PUSH BUTTON (UA) (G)
139A	1662-25402	PUSH BUTTON (BK)
139C	1662-25402	PUSH BUTTON (GB)
145	1756-09602	LABEL (UA) (BK)
145B	1756-12101	LABEL (G)
145C	1756-12101	LABEL (GB)
154	2114-106143	BUSHING, FL FILTER
155	2114-01303	BUSHING, MECHA
158	2132-3014021	SPACER, MECHA
163	2215-7010	BRACKET, POWER SWITCH
165	2219-8140	METAL FITTG
168	2219-8096	METAL FITTG
169	2219-7091	METAL FITTG, TRANS
170	2219-8208	METAL FITTG
173	2240-364	HOLDER, AC CORD
174	2240-7120	HOLDER, WIRING
182	2651-210192	SPRING
185	2601-7161	SHAFT, POWER SWITCH
191	2401-0373	WASHER METAL, MECHA
192	2401-0476	WASHER METAL, TRANS
194	2412-3022	WASHER SPRING, MECHA
195	2440-7016	NUT, SPE
197	2327-R0130062	SCREW BND+, POWER SWITCH
198	2327-R0130082	SCREW BND+
199	2327-R0130202	SCREW BND+, MECHA
200	2327-R0140102	SCREW BND+
203	2343-300627	SCREW CSK T+
205	2347-200626	SCREW BND T+
206	2347-R0130062	SCREW BND T+
208	2347-R0130064	SCREW BND T+
209	2347-R0130102	SCREW BND T+
210	2347-R0130084	SCREW BND T+
212	2347-R0140064	SCREW BND T+, CABINET
213	2347-R0130122	SCREW BND T+
215	2132-01406	SPACER
216	2132-7049	SPACER, R2
217	2132-5049	SPACER, Q2
219	2222-7231	HEAT SINK, Q2
⚠P1	4161-01401232	CORD W/PLUG (UA) (BK)
⚠P1	4161-7256	CORD W/PLUG (G) (GB)
⚠S2	4411-102729	SWITCH, ROTARY (G) (GB)
⚠T1	5584-701548	XFORMER, POWER (UA) (BK)
⚠T1	5584-702548	XFORMER, POWER (G) (GB)

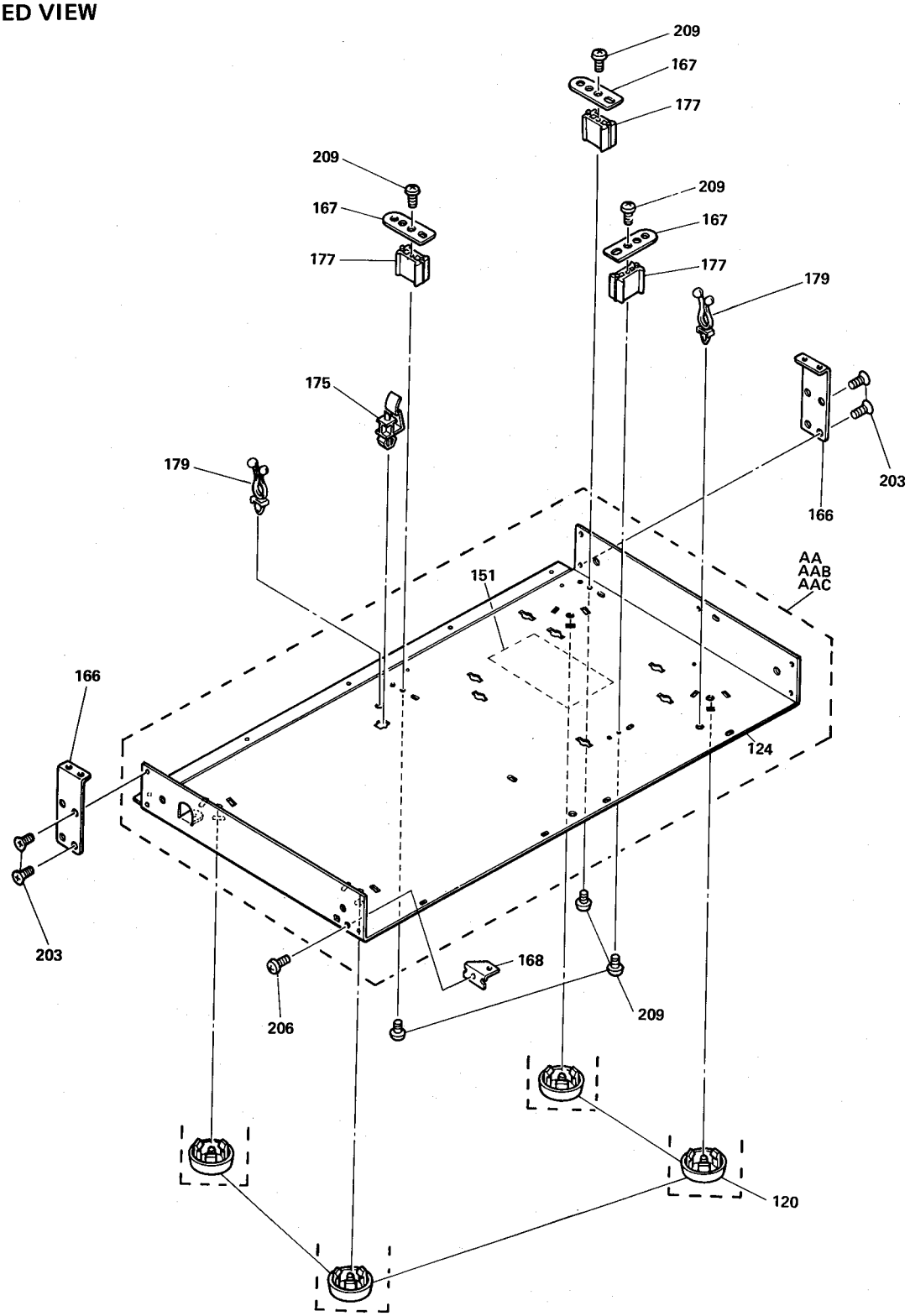
EXPLODED VIEW



PARTS LIST

Ref. No.	Part No.	Description
AC	A443-HD400A	PANEL, FRONT ASS'Y (UA) (G)
ACA	A443-HD400B	PANEL, FRONT ASS'Y (BK)
ACC	A443-HD400C	PANEL, FRONT ASS'Y (GB)
131	1531-10001	WINDOW, FL FILTER
132	1531-10102	WINDOW
133	1531-11901	WINDOW
134	1562-05201	FRAME, LEFT (UA) (G)
134A	1562-05202	FRAME, LEFT (BK)
134C	1562-05202	FRAME, LEFT (GB)
135	1562-05301	FRAME, RIGHT (UA) (G)
135A	1562-05302	FRAME, RIGHT (BK)
135C	1562-05302	FRAME, RIGHT (GB)
138	1662-21101	PUSH BUTTON (UA) (G)
138A	1662-21102	PUSH BUTTON (BK)
138C	1662-21102	PUSH BUTTON (GB)
176	2240-7266	HOLDER
178	2240-7286	HOLDER

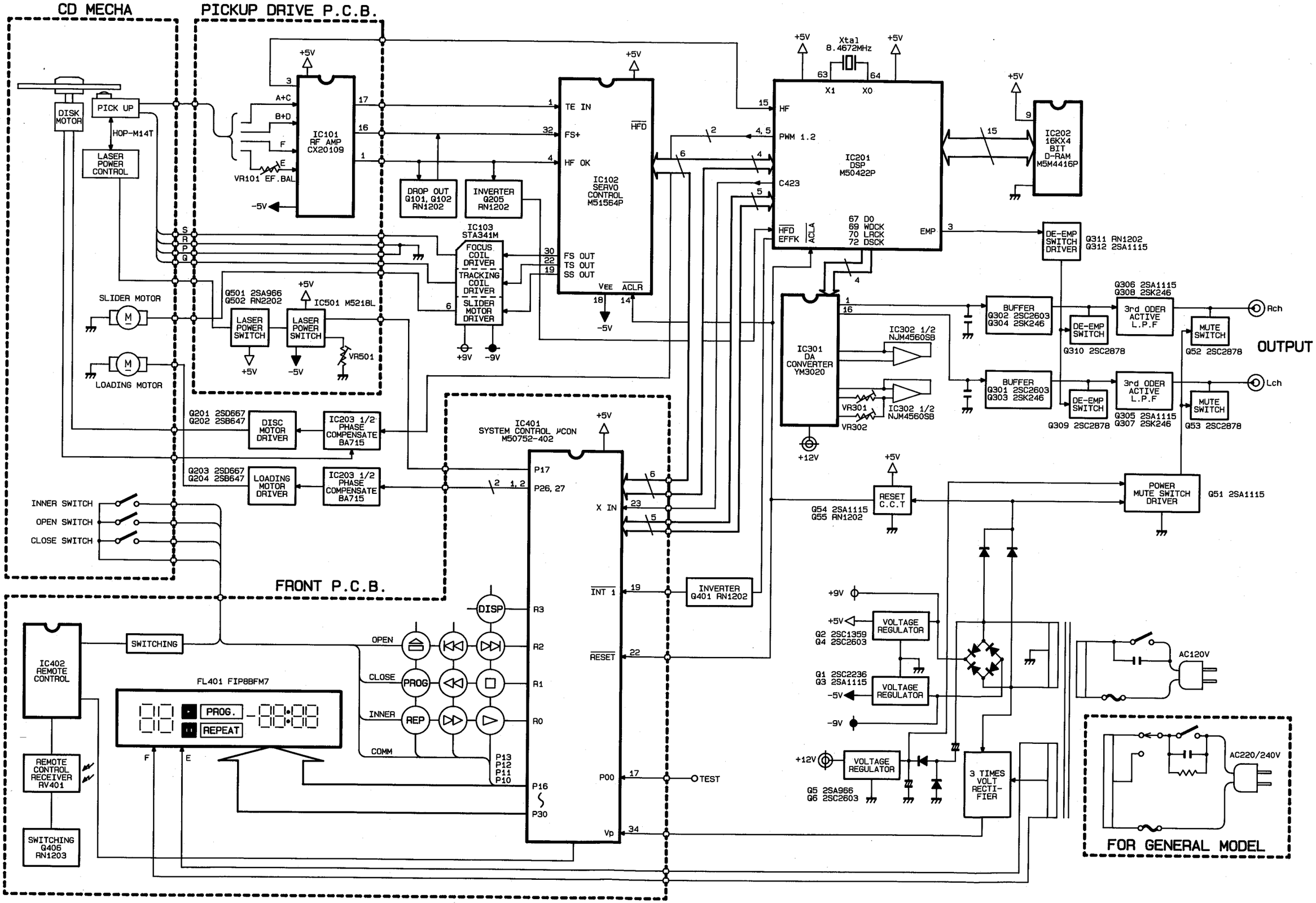
EXPLODED VIEW



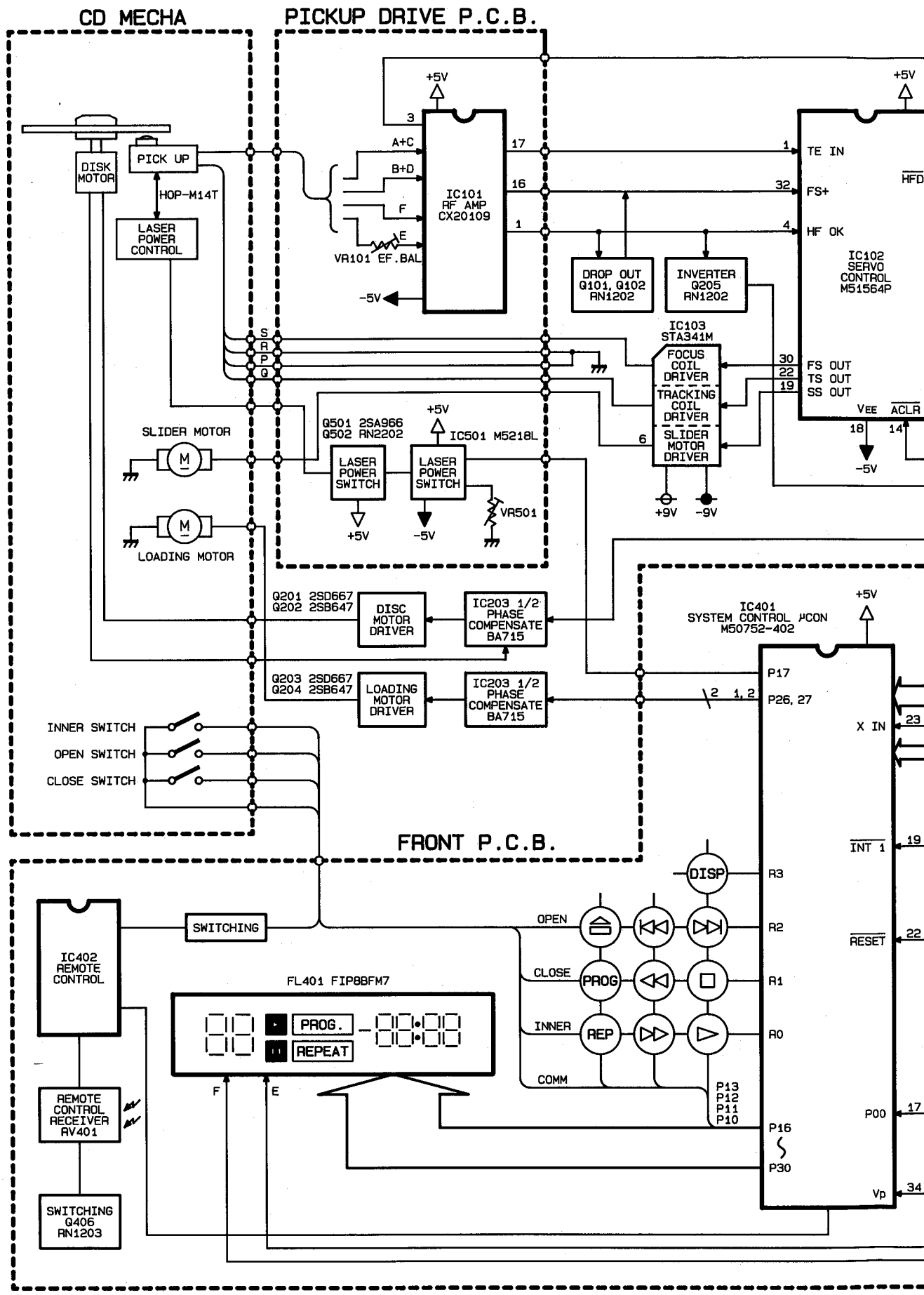
PARTS LIST

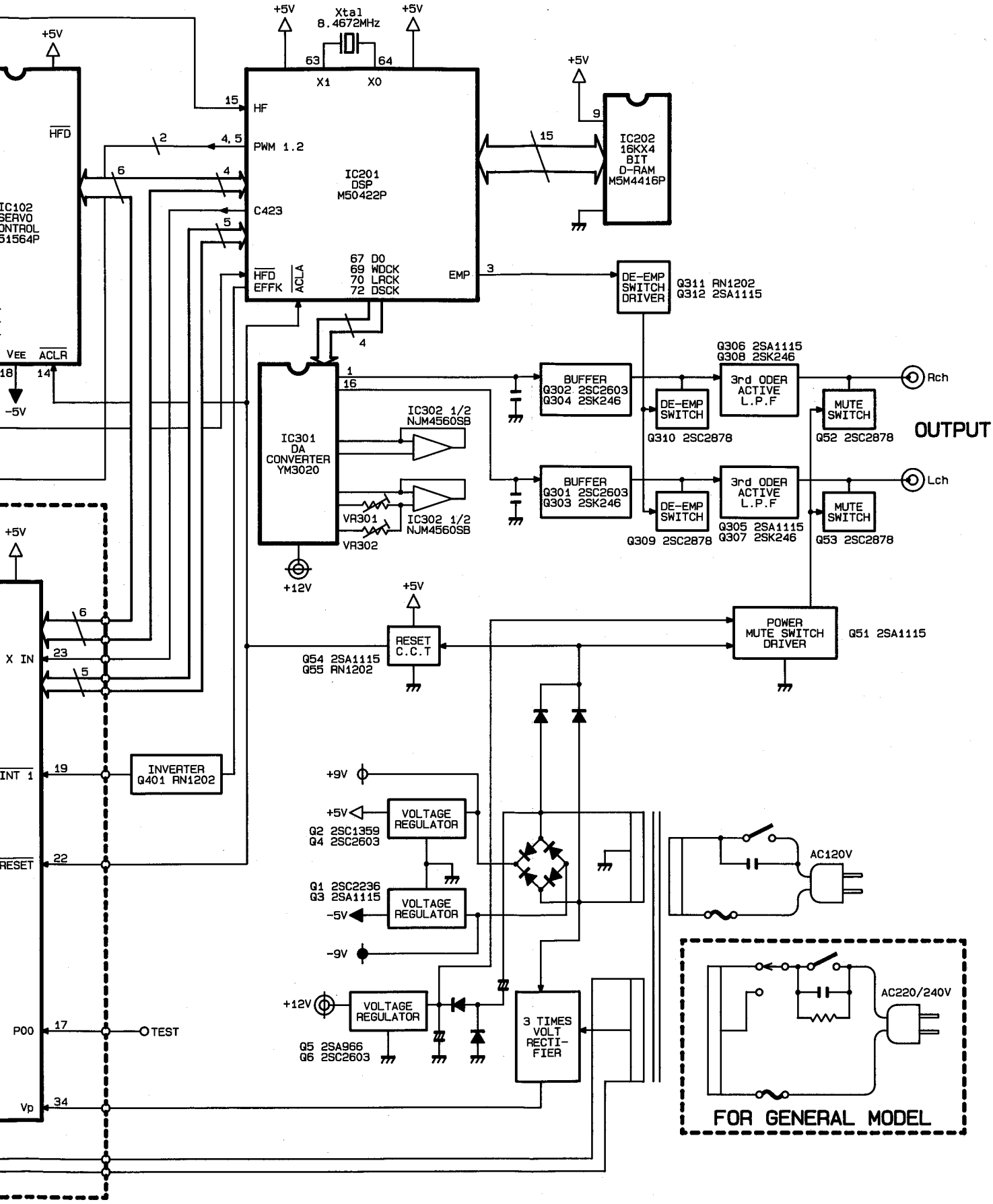
Ref. No.	Part No.	Description
AA	A424-HD400A	CABI BACK, BOTTOM ASS'Y (UA) (BK)
AAB	A424-HD400C	CABI BACK, BOTTOM ASS'Y (G)
AAC	A424-HD400E	CABI BACK, BOTTOM ASS'Y (GB)
120	1319-0139	LEG
124	1424-21101	CABI BACK, BOTTOM
151	1756-11111	LABEL
166	2219-8141	METAL FITTG, SIDE
167	2219-8142	METAL FITTG, MECHA
168	2219-8096	METAL FITTG, P.C.B.
175	2240-7264	HOLDER, P.C. BOARD
177	2240-7285	HOLDER, MECHA
179	2240-7049	HOLDER, LEAD CRAMP
203	2343-300627	SCREW CSK T+
206	2347-R0130062	SCREW BND T+
209	2347-R0130102	SCREW BND T+

BLOCK DIAGRAM



BLOCK DIAGRAM

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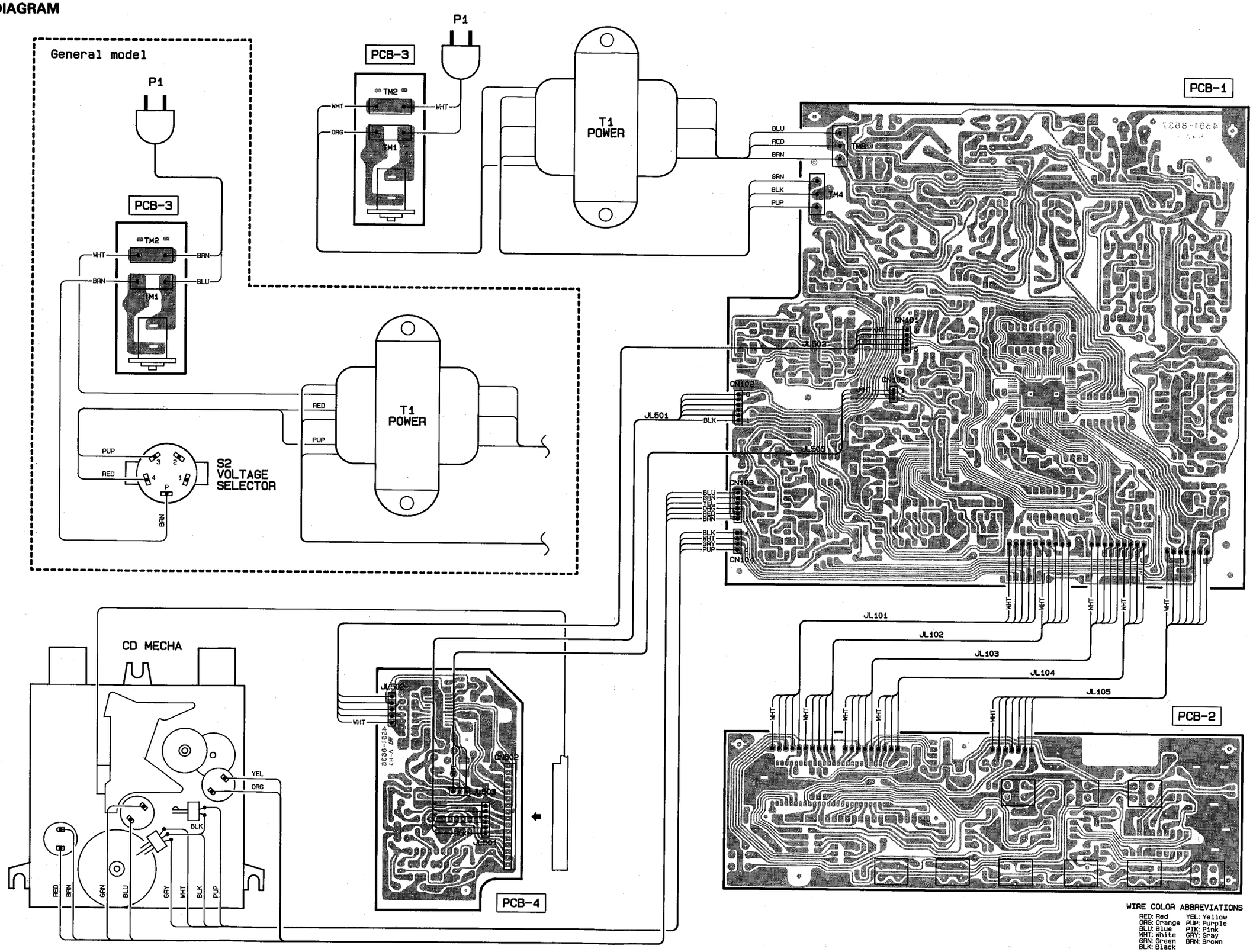
Xtal
8.4672MHz
63
64
X1
X0
HF
PWM 1.2
IC201
DSP
M50422P
C423
HFD
EFFK
ACLA
67 DO
69 WDCK
70 LRCK
72 DSCK
EMP
IC202
16KX4
BIT
D-RAM
M5M4416P
DE-EMP
SWITCH
DRIVER
Q311 RN1202
Q312 2SA1115
IC102
SERVO
CONTROL
51564P
VEE
ACLR
-5V
IC301
DA
CONVERTER
YM3020
IC302 1/2
NJM4560SB
VR301
VR302
+12V
BUFFER
Q302 2SC2603
Q304 2SK246
BUFFER
Q301 2SC2603
Q303 2SK246
DE-EMP
SWITCH
Q310 2SC2878
DE-EMP
SWITCH
Q309 2SC2878
3rd ODER
ACTIVE
L.P.F
Q306 2SA1115
Q308 2SK246
3rd ODER
ACTIVE
L.P.F
Q305 2SA1115
Q307 2SK246
MUTE
SWITCH
Q52 2SC2878
MUTE
SWITCH
Q53 2SC2878
Rch
Lch
OUTPUT
RESET
C.C.T
Q54 2SA1115
Q55 RN1202
POWER
MUTE SWITCH
DRIVER
Q51 2SA1115
X IN
INT 1
RESET
P00
Vp
TEST
INVERTER
Q401 RN1202
+9V
-9V
VOLTAGE
REGULATOR
Q2 2SC1359
Q4 2SC2603
Q1 2SC2236
Q3 2SA1115
Q5 2SA966
Q6 2SC2603
3 TIMES
VOLT
RECTI-
FIER
AC120V
AC220/240V
FOR GENERAL MODEL

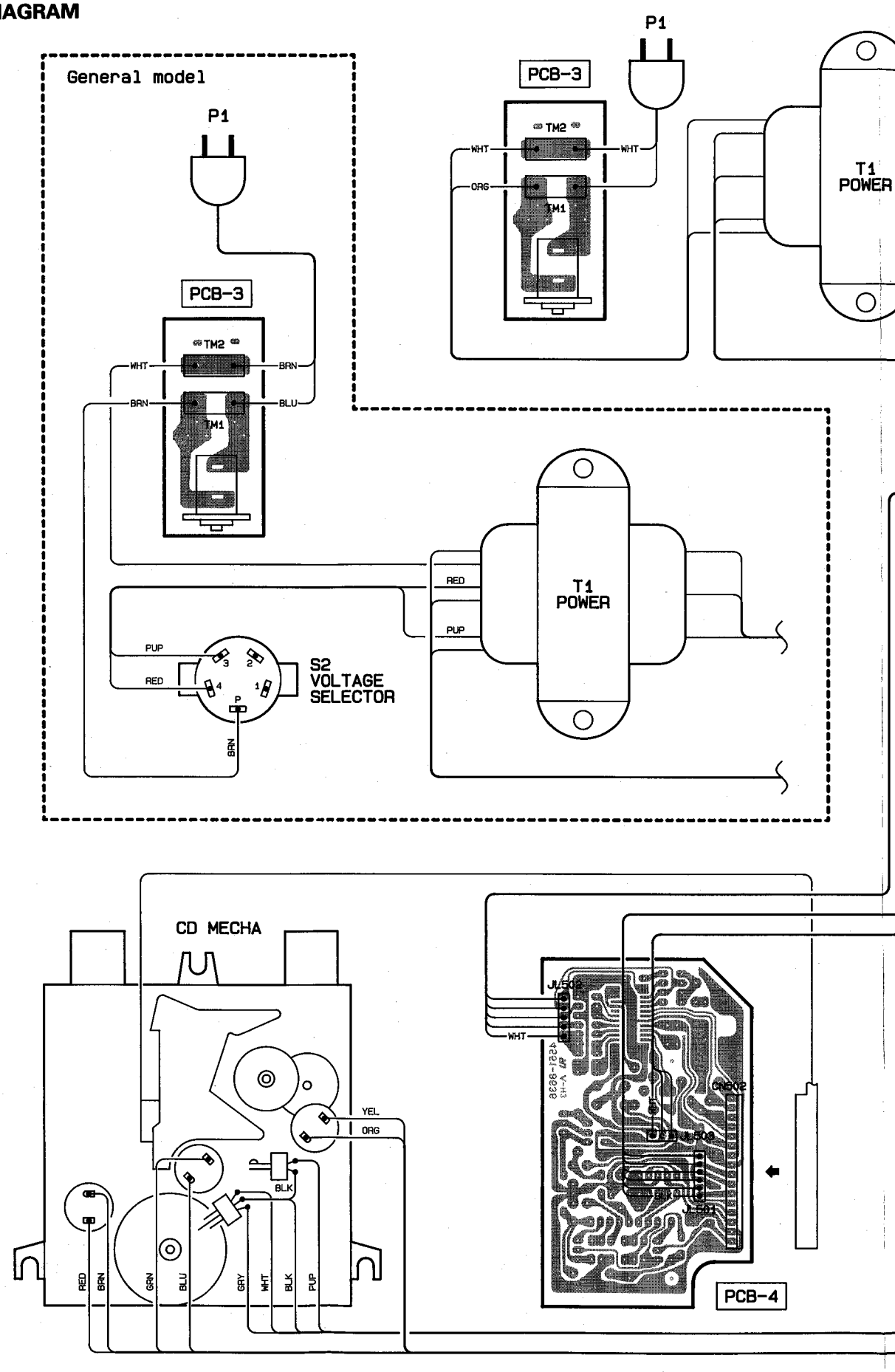
WIRING DIAGRAM

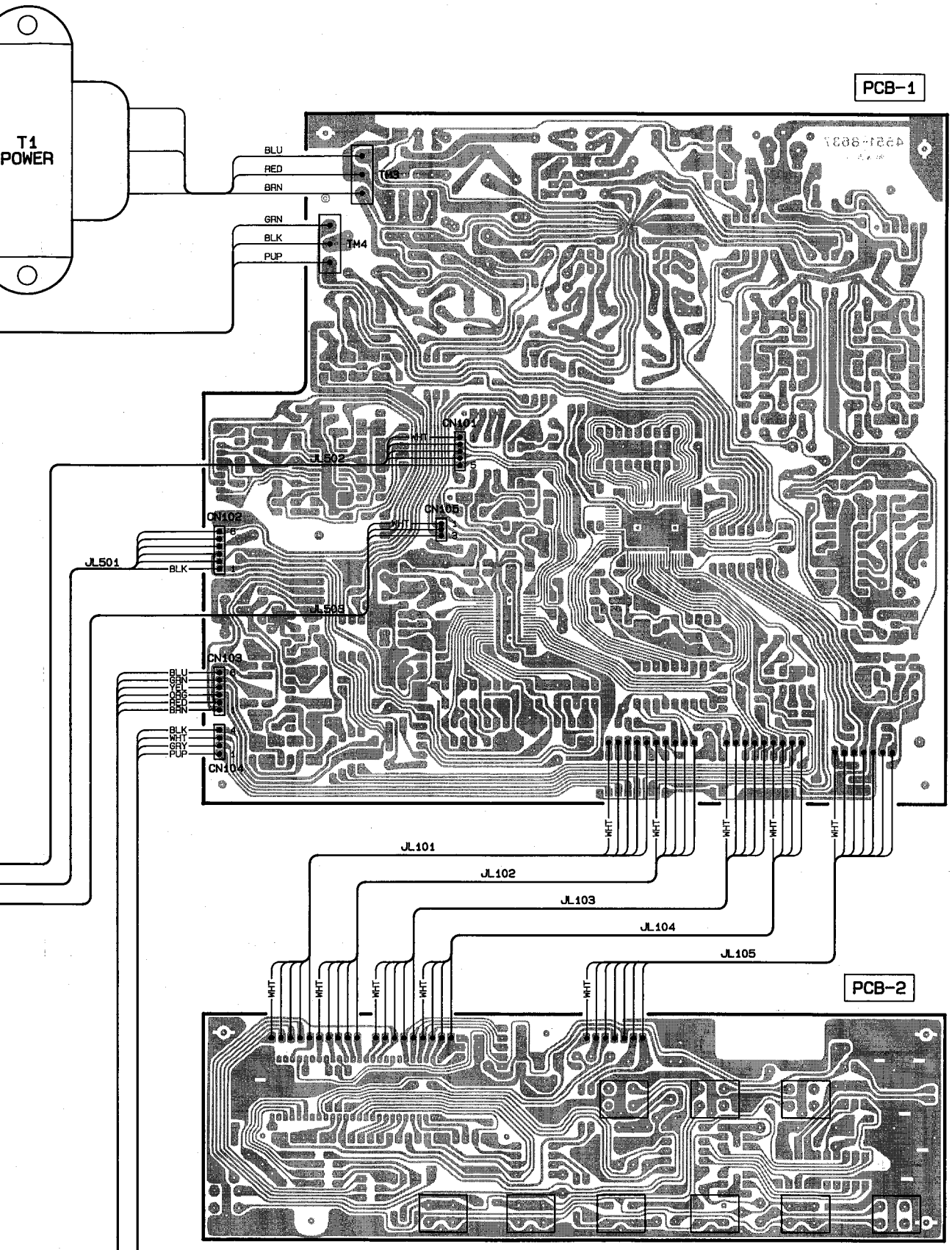


WIRE COLOR ABBREVIATIONS

RED: Red	YEL: Yellow
ORG: Orange	PUP: Purple
BLU: Blue	PNK: Pink
WHT: White	GRY: Gray
GRN: Green	BRN: Brown
BLK: Black	

WIRING DIAGRAM





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RED: Red	YEL: Yellow
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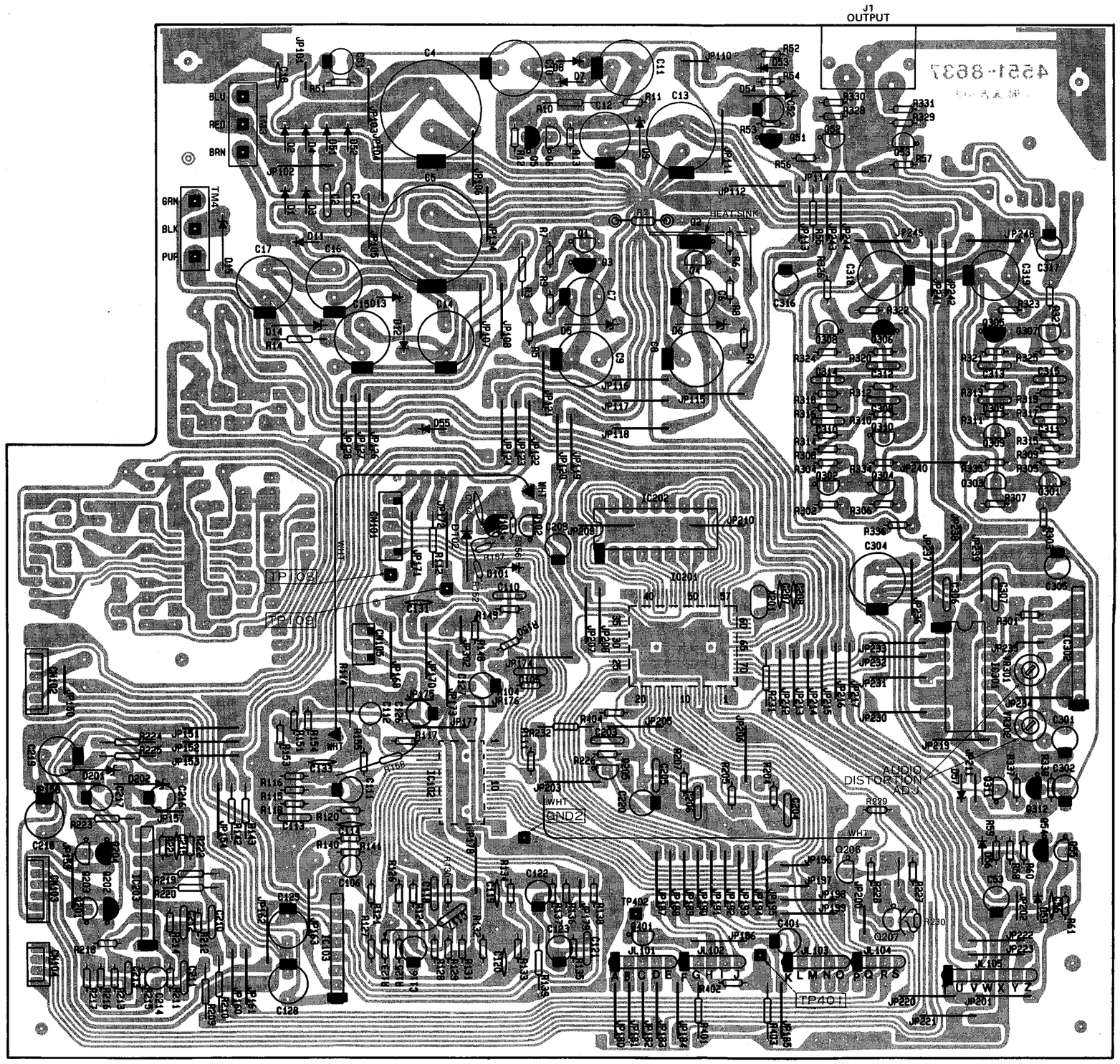
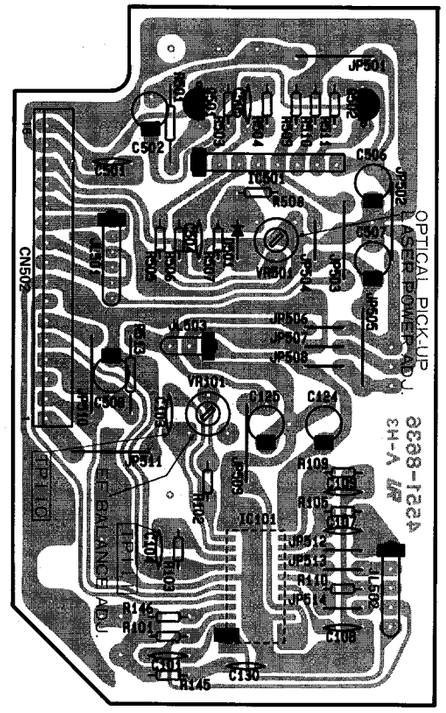
BLK: Black	

P.C. BOARDS (1)

PCB-1 Main P. C. Board

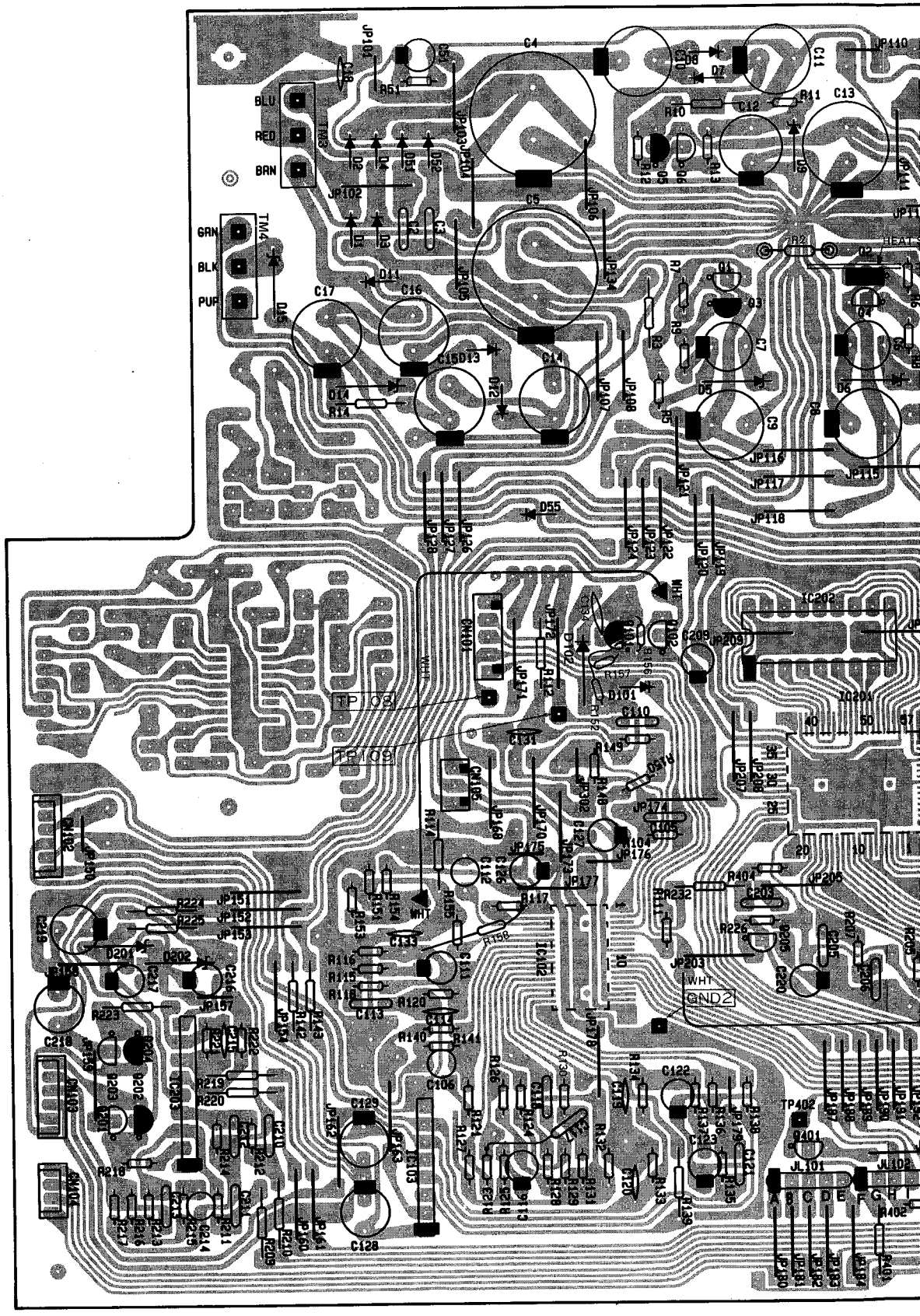


PCB-4 Pick-up Drive P. C. Board

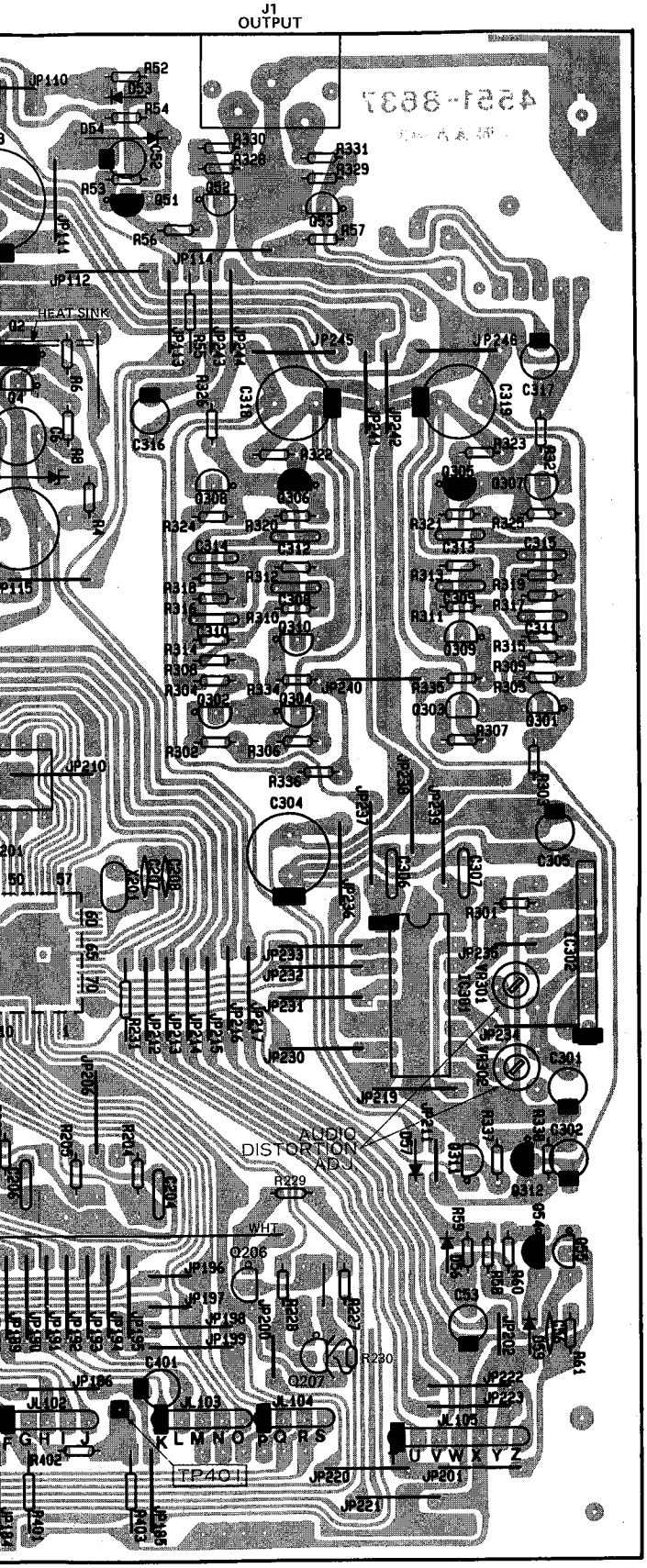


P.C. BOARDS (1)

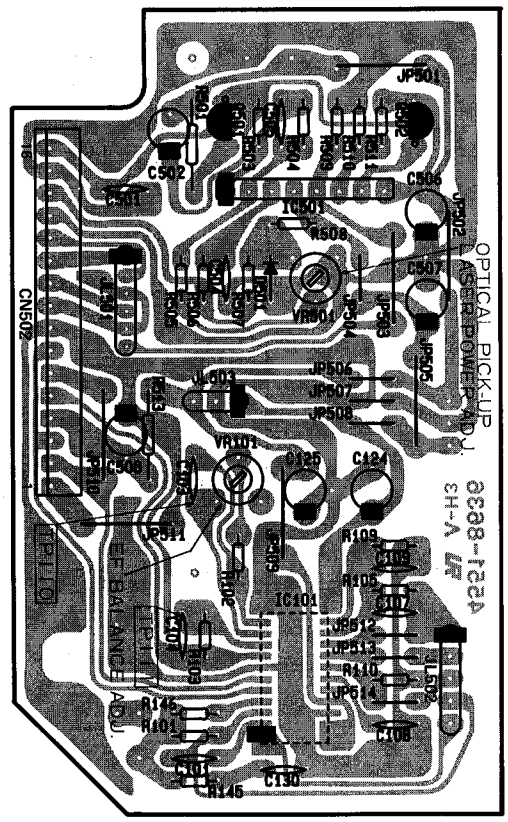
PCB-1 Main P. C. Board



F G H I J

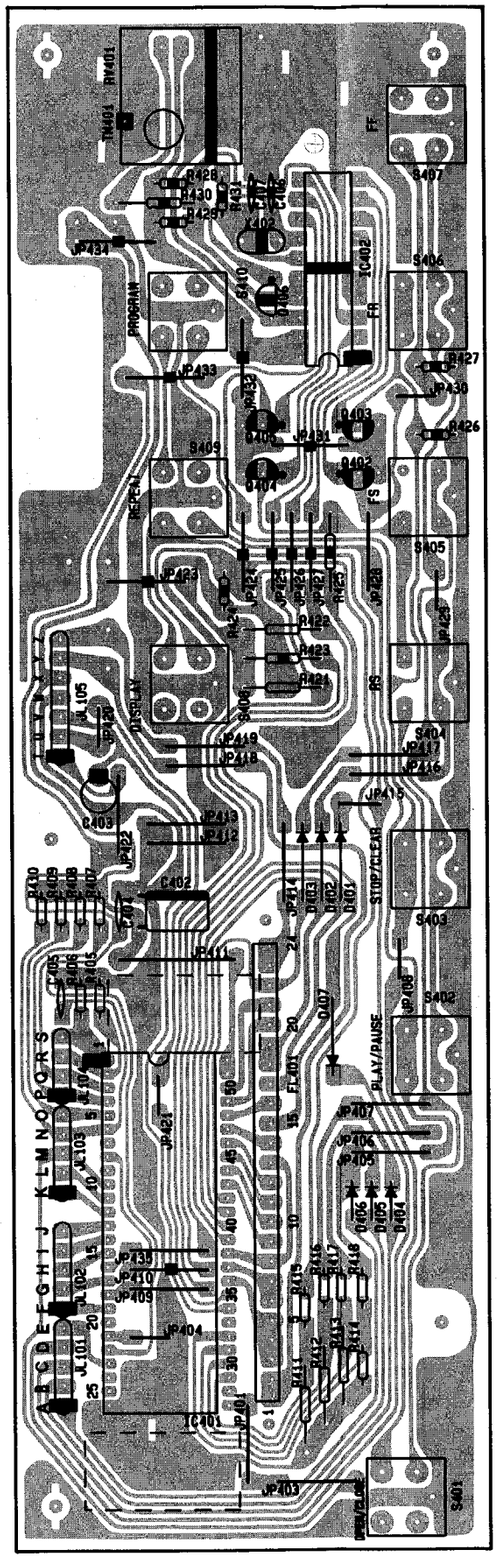


PCB-4 Pick-up Drive P. C. Board



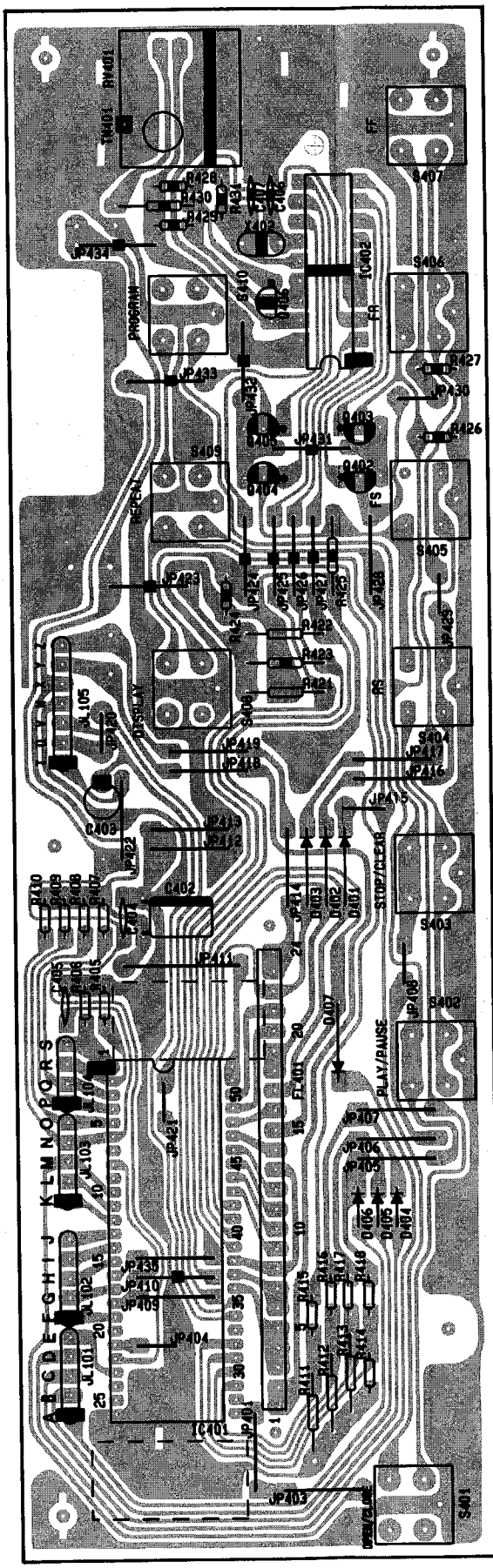
P.C. BOARDS (2)

PCB-2 Front P. C. Board



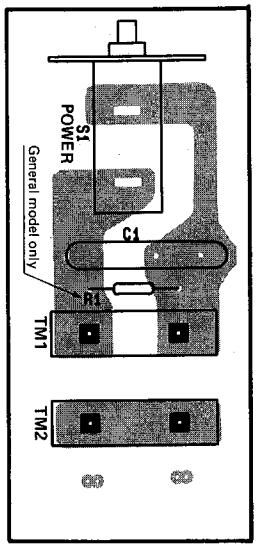
P.C. BOARDS (2)

PCB-2 Front P. C. Board



PCB-3

Power Switch P. C. Board



ELECTRICAL PARTS LIST

Ser. No.	Ref. No.	Part No.	Description
		PCB-1 MAIN P.C. BOARD	
		CAPACITORS	
571	C2	5354-104593	CAP, MYL .1 μ
571	C3	5354-104593	CAP, MYL .1 μ
544	C4	5345-478C0351	CAP, MINI ELE 4700 μ/16V
544	C5	5345-478C0351	CAP, MINI ELE 4700 μ/16V
549	C6	5345-227A041	CAP, MINI ELE 220 μ/6.3V
549	C7	5345-227A041	CAP, MINI ELE 220 μ/6.3V
545	C8	5345-477A041	CAP, MINI ELE 470 μ/6.3V
545	C9	5345-477A041	CAP, MINI ELE 470 μ/6.3V
548	C10	5345-227C041	CAP, MINI ELE 220 μ/16V
546	C11	5345-227D041	CAP, MINI ELE 220 μ/25V
547	C12	5345-227C041	CAP, MINI ELE 220 μ/16V
547	C13	5345-227C041	CAP, MINI ELE 220 μ/16V
548	C14	5345-227C041	CAP, MINI ELE 220 μ/16V
550	C15	5345-107E041	CAP, MINI ELE 100 μ/35V
550	C16	5345-107E041	CAP, MINI ELE 100 μ/35V
550	C17	5345-107E041	CAP, MINI ELE 100 μ/35V
565	C18	5361-223ZF	CAP, CER .022 μ
554	C51	5345-226C041	CAP, MINI ELE 22 μ/16V
556	C52	5345-106C041	CAP, MINI ELE 10 μ/16V
556	C53	5345-106C041	CAP, MINI ELE 10 μ/16V
578	C56	5361-103ZF	CAP, CER .01 μ
571	C105	5354-104593	CAP, MYL .1 μ
582	C106	5342-336C041	CAP, ELE BP 33 μ/16V
579	C110	5361-472KB	CAP, CER 4700p
572	C111	5345-684F0951	CAP, MINI ELE .68 μ/50V
564	C112	5342-226B041	CAP, ELE BP 22 μ/10V
574	C113	5354-274593	CAP, MYL .27 μ
591	C114	5359-S010J822	CAP, PPP 8200p
572	C116	5345-684F0951	CAP, MINI ELE .68 μ/50V
575	C117	5359-S010J273	CAP, PPP .027 μ
562	C118	5354-124593	CAP, MYL .12 μ
567	C119	5361-470KSL	CAP, CER 47p
583	C120	5361-151KSL	CAP, CER 150p
577	C121	5361-473ZF	CAP, CER .047 μ
557	C122	5345-105F041	CAP, MINI ELE 1 μ/50V
556	C123	5345-106C041	CAP, MINI ELE 10 μ/16V
551	C126	5345-107B041	CAP, MINI ELE 100 μ/10V
551	C127	5345-107B041	CAP, MINI ELE 100 μ/10V
561	C128	5345-107C041	CAP, MINI ELE 100 μ/16V
561	C129	5345-107C041	CAP, MINI ELE 100 μ/16V
599	C131	5361-122KB	CAP, CER 1200p
594	C133	5361-182KB	CAP, CER 1800p
577	C134	5361-473ZF	CAP, CER .047 μ
586	C203	5359-S010J182	CAP, PPP 1800p
576	C204	5359-S010J103	CAP, PPP .01 μ
585	C205	5359-S010J561	CAP, PPP 560p
573	C206	5354-334593	CAP, MYL .33 μ
566	C207	5361-300JCH	CAP, CER 30p
566	C208	5361-300JCH	CAP, CER 30p
555	C209	5345-476B041	CAP, MINI ELE 47 μ/10V
578	C210	5361-103ZF	CAP, CER .01 μ
578	C211	5361-103ZF	CAP, CER .01 μ
578	C212	5361-103ZF	CAP, CER .01 μ
580	C213	5361-152KB	CAP, CER 1500p
563	C214	5342-105F041	CAP, ELE BP 1 μ/50V
569	C215	5361-220KSL	CAP, CER 22p
552	C216	5345-227B041	CAP, MINI ELE 220 μ/10V
552	C217	5345-227B041	CAP, MINI ELE 220 μ/10V
543	C218	5345-107C041	CAP, MINI ELE 100 μ/16V
543	C219	5345-107C041	CAP, MINI ELE 100 μ/16V
581	C220	5345-336B041	CAP, MINI ELE 33 μ/10V
556	C301	5345-106C041	CAP, MINI ELE 10 μ/16V
558	C302	5345-335D041	CAP, MINI ELE 3.3 μ/25V
547	C304	5345-227C041	CAP, MINI ELE 220 μ/16V
554	C305	5345-226C041	CAP, MINI ELE 22 μ/16V
587	C306	5359-3325851	CAP, PPP 3300p
587	C307	5359-3325851	CAP, PPP 3300p
590	C308	5359-S010J223	CAP, PPP .022 μ
590	C309	5359-S010J223	CAP, PPP .022 μ
589	C310	5359-S010J152	CAP, PPP 1500p
589	C311	5359-S010J152	CAP, PPP 1500p
588	C312	5359-S010J392	CAP, PPP 3900p
588	C313	5359-S010J392	CAP, PPP 3900p
584	C314	5359-2215851	CAP, PPP 220p
584	C315	5359-2215851	CAP, PPP 220p
553	C316	5345-476C0951	CAP, MINI ELE 47 μ/16V
553	C317	5345-476C0951	CAP, MINI ELE 47 μ/16V
561	C318	5345-107C041	CAP, MINI ELE 100 μ/16V
561	C319	5345-107C041	CAP, MINI ELE 100 μ/16V
557	C401	5345-105F041	CAP, MINI ELE 1 μ/50V
		RESISTORS	
600	⚠R2	5102-4R74715	RES, FUSE 4.7
600	⚠R3	5102-4R74715	RES, FUSE 4.7
614	R4	5232-152J16P	RES, CBN 1/6P 1.5K
614	R5	5232-152J16P	RES, CBN 1/6P 1.5K
610	R6	5232-471J16P	RES, CBN 1/6P 470
610	R7	5232-471J16P	RES, CBN 1/6P 470
606	R8	5232-101J16P	RES, CBN 1/6P 100
606	R9	5232-101J16P	RES, CBN 1/6P 100
601	⚠R10	5102-1004715	RES, FUSE 10
617	R11	5232-332J16P	RES, CBN 1/6P 3.3K
610	R12	5232-471J16P	RES, CBN 1/6P 470
606	R13	5232-101J16P	RES, CBN 1/6P 100
603	⚠R14	5102-1514715	RES, FUSE 150
614	R51	5232-152J16P	RES, CBN 1/6P 1.5K
637	R52	5232-564J16P	RES, CBN 1/6P 560K
633	R53	5232-104J16P	RES, CBN 1/6P 100K
614	R54	5232-152J16P	RES, CBN 1/6P 1.5K
649	R55	5135-154522	RES, CBN 1/2P 150K
615	R56	5232-182J16P	RES, CBN 1/6P 1.8K
615	R57	5232-182J16P	RES, CBN 1/6P 1.8K
622	R58	5232-103J16P	RES, CBN 1/6P 10K
634	R59	5232-274J16P	RES, CBN 1/6P 270K
633	R60	5232-104J16P	RES, CBN 1/6P 100K
622	R61	5232-103J16P	RES, CBN 1/6P 10K
633	R104	5232-104J16P	RES, CBN 1/6P 100K
611	R111	5232-102J16P	RES, CBN 1/6P 1K
620	R112	5135-183522	RES, CBN 1/2P 18K
644	R114	5135-822522	RES, CBN 1/2P 8.2K
605	R115	5232-470J16P	RES, CBN 1/6P 47
657	R116	5232-562J16P	RES, CBN 1/6P 5.6K
629	R117	5232-473J16P	RES, CBN 1/6P 47K
615	R118	5232-182J16P	RES, CBN 1/6P 1.8K
632	R120	5232-823J16P	RES, CBN 1/6P 82K
614	R121	5232-152J16P	RES, CBN 1/6P 1.5K
629	R123	5232-473J16P	RES, CBN 1/6P 47K
643	R124	5232-183J16P	RES, CBN 1/6P 18K
624	R125	5232-153J16P	RES, CBN 1/6P 15K
624	R126	5232-153J16P	RES, CBN 1/6P 15K
623	R127	5232-123J16P	RES, CBN 1/6P 12K
629	R128	5232-473J16P	RES, CBN 1/6P 47K
630	R129	5232-563J16P	RES, CBN 1/6P 56K
611	R130	5232-102J16P	RES, CBN 1/6P 1K
611	R131	5232-102J16P	RES, CBN 1/6P 1K
626	R132	5232-273J16P	RES, CBN 1/6P 27K
627	R133	5232-333J16P	RES, CBN 1/6P 33K
628	R134	5232-153J16P	RES, CBN 1/6P 15K
629	R135	5232-473J16P	RES, CBN 1/6P 47K
623	R136	5232-123J16P	RES, CBN 1/6P 12K
622	R137	5232-223J16P	RES, CBN 1/6P 22K
605	R138	5232-470J16P	RES, CBN 1/6P 47
640	R139	5135-470522	RES, CBN 1/2P 47
605	R140	5232-470J16P	RES, CBN 1/6P 47
611	R141	5232-102J16P	RES, CBN 1/6P 1K
600	⚠R142	5102-4R74715	RES, FUSE 4.7
600	⚠R143	5102-4R74715	RES, FUSE 4.7
625	R148	5232-822J16P	RES, CBN 1/6P 8.2K
641	R149	5232-335J16P	RES, CBN 1/6P 3.3M
641	R150	5232-335J16P	RES, CBN 1/6P 3.3M
622	R151	5232-103J16P	RES, CBN 1/6P 10K
619	R152	5232-102J16P	RES, CBN 1/6P 1K
618	R153	5232-472J16P	RES, CBN 1/6P 4.7K
634	R154	5232-274J16P	RES, CBN 1/6P 270K
629	R155	5232-223J16P	RES, CBN 1/6P 22K
636	R156	5232-223J16P	RES, CBN 1/6P 22K

Ser. No.	Ref. No.	Part No.	Description
598	R157	5232-332J16P	RES, CBN 1/6P 3.3K
708	R158	5232-225J16P	RES, CBN 1/6P 2.2M
627	R204	5232-333J16P	RES, CBN 1/6P 33K
639	R205	5232-124J16P	RES, CBN 1/6P 120K
607	R207	5232-392J16P	RES, CBN 1/6P 3.9K
648	R209	5135-823522	RES, CBN 1/2P 82K
648	R210	5135-823522	RES, CBN 1/2P 82K
637	R211	5232-564J16P	RES, CBN 1/6P 560K
637	R212	5232-564J16P	RES, CBN 1/6P 560K
630	R213	5232-563J16P	RES, CBN 1/6P 56K
631	R214	5232-683J16P	RES, CBN 1/6P 68K
626	R215	5232-273J16P	RES, CBN 1/6P 27K
623	R216	5232-123J16P	RES, CBN 1/6P 12K
604	R217	5232-2R2J16P	RES, CBN 1/6P 2.2
605	R218	5232-470J16P	RES, CBN 1/6P 47
647	R219	5135-104522	RES, CBN 1/2P 100K
647	R220	5135-104522	RES, CBN 1/2P 100K
639	R221	5232-124J16P	RES, CBN 1/6P 120K
639	R222	5232-124J16P	RES, CBN 1/6P 120K
640	R223	5135-470522	RES, CBN 1/2P 47
602	⚠R224	5102-1014715	RES, FUSE 100
602	⚠R225	5102-1014715	RES, FUSE 100
627	R226	5232-333J16P	RES, CBN 1/6P 33K
643	R227	5232-183J16P	RES, CBN 1/6P 18K
643	R228	5232-183J16P	RES, CBN 1/6P 18K
706	R229	5232-183J16P	RES, CBN 1/6P 18K
707	R230	5232-183J16P	RES, CBN 1/6P 18K
646	R231	5135-471522	RES, CBN 1/2P 470
650	R232	5135-102522	RES, CBN 1/2P 1K
609	R301	5232-181J16P	RES, CBN 1/6P 180
610	R302	5232-471J16P	RES, CBN 1/6P 470
610	R303	5232-471J16P	RES, CBN 1/6P 470
608	R304	5232-221J16P	RES, CBN 1/6P 220
608	R305	5232-221J16P	RES, CBN 1/6P 220
606	R306	5232-101J16P	RES, CBN 1/6P 100
606	R307	5232-101J16P	RES, CBN 1/6P 100
612	R308	5232-122J16P	RES, CBN 1/6P 1.2K
612	R309	5232-122J16P	RES, CBN 1/6P 1.2K
621	R310	5232-391J16P	RES, CBN 1/6P 390
621	R311	5232-391J16P	RES, CBN 1/6P 390
638	R312	5232-105J16P	RES, CBN 1/6P 1M
638	R313	5232-105J16P	RES, CBN 1/6P 1M
616	R314	5232-222J16P	RES, CBN 1/6P 2.2K
616	R315	5232-222J16P	RES, CBN 1/6P 2.2K
618	R316	5232-472J16P	RES, CBN 1/6P 4.7K
618	R317	5232-472J16P	RES, CBN 1/6P 4.7K
618	R318	5232-472J16P	RES, CBN 1/6P 4.7K
618	R319	5232-472J16P	RES, CBN 1/6P 4.7K
613	R320	5232-331J16P	RES, CBN 1/6P 330
613	R321	5232-331J16P	RES, CBN 1/6P 330
608	R322	5232-221J16P	RES, CBN 1/6P 220
608	R323	5232-221J16P	RES, CBN 1/6P 220
606	R324	5232-101J16P	RES, CBN 1/6P 100
606	R325	5232-101J16P	RES, CBN 1/6P 100
608	R326	5232-221J16P	RES, CBN 1/6P 220
608	R327	5232-221J16P	RES, CBN 1/6P 220
622	R328	5232-103J16P	RES, CBN 1/6P 10K
622	R329	5232-103J16P	RES, CBN 1/6P 10K
606	R330	5232-101J16P	RES, CBN 1/6P 100
606	R331	5232-101J16P	RES, CBN 1/6P 100
618	R334	5232-472J16P	RES, CBN 1/6P 4.7K
618	R335	5232-472J16P	RES, CBN 1/6P 4.7K
635	R336	5232-154J16P	RES, CBN 1/6P 150K
632	R337	5232-823J16P	RES, CBN 1/6P 82K
627	R338	5232-333J16P	RES, CBN 1/6P 33K
642	R401	5135-103522	RES, CBN 1/2P 10K
606	R402	5232-101J16P	RES, CBN 1/6P 100
645	R403	5135-473522	RES, CBN 1/2P 47K
629	R404	5232-473J16P	RES, CBN 1/6P 47K
		INTEGRATED CIRCUITS	
502	IC102	5654-M51564P	IC, DIGITAL
508	IC103	5653-STA341M	IC, LINEAR
503	IC201	5654-M50422P	IC, DIGITAL
504	IC202	5654-M5M4416P	IC, DIGITAL
511	IC203	5653-BA715	IC, LINEAR
505	IC301	5654-YM3020	IC, DIGITAL
509	IC302	5653-NJ4560SB	IC, LINEAR
		TRANSISTORS	
520	Q1	5614-667 (C)	XISTOR, NPN A
514	Q2	5612-1375	XISTOR, PNP A
513	Q3	5611-1115 (F) or (E)	XISTOR, PNP R
519	Q4	5613-2603 (F) or (E)	XISTOR, NPN R
515	Q5	5612-647 (C)	XISTOR, PNP A
519	Q6	5613-2603 (F) or (E)	XISTOR, NPN R
513	Q51	5611-1115 (F) or (E)	XISTOR, PNP R
522	Q52	5613-2878 (B)	XISTOR, NPN R
522	Q53	5613-2878 (B)	XISTOR, NPN R
513	Q54	5611-1115 (F) or (E)	XISTOR, PNP R
521	Q55	5613-RN1202	XISTOR, NPN R
530	Q101	5611-1115 (F)	XISTOR, PNP R
525	Q102	5613-RN1203	XISTOR, NPN R
524	Q201	5614-667 (C)	XISTOR, NPN A
518	Q202	5612-647 (C)	XISTOR, PNP A
524	Q203	5614-667 (C)	XISTOR, NPN A
518	Q204	5612-647 (C)	XISTOR, PNP A
521	Q205	5613-RN1202	XISTOR, NPN R
703	Q206	5613-RN1203	XISTOR, NPN R
704	Q207	5613-RN1203	XISTOR, NPN R
519	Q301	5613-2603 (F) or (E)	XISTOR, NPN R
519	Q302	5613-2603 (F) or (E)	XISTOR, NPN R
526	Q303	5616-2SK246 (Y)	FET, N-CH
526	Q304	5616-2SK246 (Y)	FET, N-CH
513	Q305	5611-1115 (F) or (E)	XISTOR, PNP R
513	Q306	5611-1115 (F) or (E)	XISTOR, PNP R
527	Q307	5616-SK246GR1	FET, N-CH
527	Q308	5616-SK246GR1	FET, N-CH
522	Q309	5613-2878 (B)	XISTOR, NPN R
522	Q310	5613-2878 (B)	XISTOR, NPN R
521	Q311	5613-RN1202	XISTOR, NPN R
513	Q312	5611-1115 (F) or (E)	XISTOR, PNP R
521	Q401	5613-RN1202	XISTOR, NPN R
		DIODES	
531	⚠D1	5632-S5566B	DIODE, RECT
531	⚠D2	5632-S5566B	DIODE, RECT
531	⚠D3	5632-S5566B	DIODE, RECT
531	⚠D4	5632-S5566B	DIODE, RECT
540	D5	5635-HZ6B1L	DIODE, ZENER
540	D6	5635-HZ6B1L	DIODE, ZENER
531	⚠D7	5632-S5566B	DIODE, RECT
531	⚠D8	5632-S5566B	DIODE, RECT
539	D9	5635-HZ12B3L	DIODE, ZENER
531	⚠D11	5632-S5566B	DIODE, RECT
531	⚠D12	5632-S5566B	DIODE, RECT
531	⚠D13	5632-S5566B	DIODE, RECT
537	D14	5635-HZ27-2	DIODE, ZENER
538	D15	5635-HZ5B-2	DIODE, ZENER
531	⚠D51	5632-S5566B	DIODE, RECT
531	⚠D52	5632-S5566B	DIODE, RECT
533	D53	5631-1SS133	DIODE, DET
541	D54	5635-HZ6A1L	DIODE, ZENER
533	D55	5631-1SS133	DIODE, DET
533	D56	5631-1SS133	DIODE, DET
533	D57	5631-1SS133	DIODE, DET
533	D59	5631-1SS133	DIODE, DET
533	D101	5631-1SS133	DIODE, DET
536	D102	5631-1S2473	DIODE, DET
542	D201	5635-HZ9A1L	DIODE, ZENER
542	D202	5635-HZ9A1L	DIODE, ZENER
		CONTROLS	
595	VR301	5101-20101937	RES, SEMI FIX 200
595	VR302	5101-20101937	RES, SEMI FIX 200
		MISCELLANEOUS	
664	J1	4482-0131	PIN JACK, 2P
528	X201	5691-00846731	XTAL, OSC
672	CN101	4443-0501102	CONNECTOR
671	CN102	4443-0601140	CONNECTOR
671	CN103	4443-0601140	CONNECTOR

Ser. No.	Ref. No.	Part No.	Description
670	CN104	4443-0401140	CONNECTOR
669	CN105	4443-0301102	CONNECTOR
687	TM3	4214-11031	TERMINAL
687	TM4	4214-11031	TERMINAL
686	TP1	4214-132	TERMINAL
686	TP101	4214-132	TERMINAL
686	TP102	4214-132	TERMINAL
686	TP103	4214-132	TERMINAL
686	TP104	4214-132	TERMINAL
686	TP105	4214-132	TERMINAL
686	TP106	4214-132	TERMINAL
686	TP107	4214-132	TERMINAL
686	TP108	4214-132	TERMINAL
686	TP109	4214-132	TERMINAL
686	TP401	4214-132	TERMINAL
686	TP402	4214-132	TERMINAL

PCB-2 FRONT P.C. BOARD

CAPACITORS

559	C402	5345-226A0961	CAP, MINI ELE 22 μ/6.3V
560	C403	5345-226E0961	CAP, MINI ELE 22 μ/35V
592	C404	5361-103ZF	CAP, CER .01 μ
570	C405	5361-102KB	CAP, CER 1000p
711	C406	5361-101JCH	CAP, CER 100p
711	C407	5361-101JCH	CAP, CER 100p

RESISTORS

652	R405	5232-103J16P	RES, CBN 1/6P 10K
652	R406	5232-103J16P	RES, CBN 1/6P 10K
652	R407	5232-103J16P	RES, CBN 1/6P 10K
652	R408	5232-103J16P	RES, CBN 1/6P 10K
652	R409	5232-103J16P	RES, CBN 1/6P 10K
652	R410	5232-103J16P	RES, CBN 1/6P 10K
654	R411	5135-103522	RES, CBN 1/2P 10K
654	R412	5135-103522	RES, CBN 1/2P 10K
654	R413	5135-103522	RES, CBN 1/2P 10K
652	R414	5232-103J16P	RES, CBN 1/6P 10K
651	R415	5232-101J16P	RES, CBN 1/6P 100
651	R416	5232-101J16P	RES, CBN 1/6P 100
651	R417	5232-101J16P	RES, CBN 1/6P 100
651	R418	5232-101J16P	RES, CBN 1/6P 100
655	R421	5135-473522	RES, CBN 1/2P 47K
655	R422	5135-473522	RES, CBN 1/2P 47K
655	R423	5135-473522	RES, CBN 1/2P 47K
652	R424	5232-103J16P	RES, CBN 1/6P 10K
654	R425	5135-103522	RES, CBN 1/2P 10K
652	R426	5232-103J16P	RES, CBN 1/6P 10K
652	R427	5232-103J16P	RES, CBN 1/6P 10K
656	R428	5232-473J16P	RES, CBN 1/6P 47K
652	R429	5232-103J16P	RES, CBN 1/6P 10K
654	R430	5135-103522	RES, CBN 1/2P 10K
653	R431	5232-105J16P	RES, CBN 1/6P 1M

INTEGRATED CIRCUITS

501	IC401	5654-M752-402	IC, DIGITAL
506	IC402	5654-M761-430	IC, DIGITAL

TRANSISTORS

516	Q402	5611-RN2202	XISTOR, PNP R
516	Q403	5611-RN2202	XISTOR, PNP R
516	Q404	5611-RN2202	XISTOR, PNP R
516	Q405	5611-RN2202	XISTOR, PNP R
523	Q406	5613-RN1203	XISTOR, NPN R

DIODES

535	D401	5631-1S2473	DIODE, DET
535	D402	5631-1S2473	DIODE, DET
535	D403	5631-1S2473	DIODE, DET
534	D404	5631-1SS133	DIODE, DET
534	D405	5631-1SS133	DIODE, DET
534	D406	5631-1SS133	DIODE, DET
535	D407	5631-1S2473	DIODE, DET

MISCELLANEOUS

660	S401	4431-A017240	SWITCH, PUSH
660	S402	4431-A017240	SWITCH, PUSH
660	S403	4431-A017240	SWITCH, PUSH
660	S404	4431-A017240	SWITCH, PUSH
660	S405	4431-A017240	SWITCH, PUSH
660	S406	4431-A017240	SWITCH, PUSH
660	S407	4431-A017240	SWITCH, PUSH
661	S408	4431-A010196	SWITCH, PUSH
661	S409	4431-A010196	SWITCH, PUSH
661	S410	4431-A010196	SWITCH, PUSH
529	X402	5693-CSB400P	OSC, CER
658	FL401	5722-26	TUBE DISPLAY
680	JL101	4242-R0105181	JUMPER LEAD
680	JL102	4242-R0105181	JUMPER LEAD
680	JL103	4242-R0105181	JUMPER LEAD
681	JL104	4242-R0104181	JUMPER LEAD
679	JL105	4242-R0107181	JUMPER LEAD
663	RU401	6143-00301	RECEIVE UNIT

PCB-3 POWER SWITCH P.C. BOARD

CAPACITOR

593	⚠C1	5352-S010M103	CAP, MTL .01 μ

RESISTORS

042B	⚠R1	5135-335J50P	RES, CBN 1/2P 3.3M (G)
042C	⚠R1	5135-335J50P	RES, CBN 1/2P 3.3M (GB)

MISCELLANEOUS

662	⚠S1	4433-00702	SWITCH, POWER
685	TM1	4214-11024	TERMINAL
685	TM2	4214-11024	TERMINAL

PCB-4 PICKUP DRIVE P.C. BOARD

CAPACITORS

733	C101	5361-103ZF	CAP, CER .01 μ
734	C103	5361-101KSL	CAP, CER 100p
734	C104	5361-101KSL	CAP, CER 100p
712	C107	5361-680KSL	CAP, CER 68p
713	C108	5361-333ZF	CAP, CER .033 μ
712	C109	5361-680KSL	CAP, CER 68p
729	C124	5345-107B041	CAP, MINI ELE 100 μ/10V
729	C125	5345-107B041	CAP, MINI ELE 100 μ/10V
714	C130	5361-180JCH	CAP, CER 18p
733	C501	5361-103ZF	CAP, CER .01 μ
728	C502	5345-106C041	CAP, MINI ELE 10 μ/16V
731	C504	5361-221KSL	CAP, CER 220p
732	C505	5361-121KSL	CAP, CER 120p
729	C506	5345-107B041	CAP, MINI ELE 100 μ/10V
729	C507	5345-107B041	CAP, MINI ELE 100 μ/10V
729	C508	5345-107B041	CAP, MINI ELE 100 μ/10V

RESISTORS

715	R101	5232-183J16P	RES, CBN 1/6P 18K
716	R102	5232-563J16P	RES, CBN 1/6P 56K
726	R103	5232-104J16P	RES, CBN 1/6P 100K
739	R105	5232-683J16P	RES, CBN 1/6P 68K
739	R109	5232-683J16P	RES, CBN 1/6P 68K
722	R110	5232-103J16P	RES, CBN 1/6P 10K
717	R145	5232-272J16P	RES, CBN 1/6P 2.7K
725	R146	5232-562J16P	RES, CBN 1/6P 5.6K
727	R501	5135-270522	RES, CBN 1/2P 27
718	R503	5232-331J16P	RES, CBN 1/6P 330
724	R504	5232-105J16P	RES, CBN 1/6P 1M
722	R505	5232-103J16P	RES, CBN 1/6P 10K
719	R506	5232-222J16P	RES, CBN 1/6P 2.2K
720	R507	5232-821J16P	RES, CBN 1/6P 820
719	R508	5232-222J16P	RES, CBN 1/6P 2.2K
726	R509	5232-104J16P	RES, CBN 1/6P 100K
721	R510	5232-332J16P	RES, CBN 1/6P 3.3K
722	R511	5232-103J16P	RES, CBN 1/6P 10K
723	R513	5135-103522	RES, CBN 1/2P 10K

INTEGRATED CIRCUIT

507	IC101	5653-CX20109	IC, LINEAR
510	IC501	5653-M5218L	IC, LINEAR

Ser. No.	Ref. No.	Part No.	Description
		TRANSISTORS	
517	Q501	5612-647 (C)	XISTOR, PNP A
512	Q502	5611-RN2202	XISTOR, PNP R
		DIODES	
737	D501	5631-1SS133	DIODE, DET
		CONTROLS	
597	VR101	5101-10401933	RES, SEMI FIX 100K
735	VR501	5101-50201933	RES, SEMI FIX 5K
		MISCELLANEOUS	
676	CN502	4443-01301016	CONNECTOR
677	JL501	4163-01409006	CONNECTOR W/W
673	JL502	4163-01701005	CONNECTOR W/W
674	JL503	4163-01702003	CONNECTOR W/W

ABBREVIATIONS IN PARTS LIST

CAPACITORS

CAP, MINI ELE	: Electrolytic
CAP, CER	: Ceramic
CAP, PPP	: Polypropylene
CAP, MYL	: Mylar
CAP, MCA	: Mica
CAP, MINI BP	: Bipolar
CAP, ELE BP	: Electrolytic Bipolar
470 μ	: 470 μF
6800p	: 6800pF
.047 μ	: 0.047 μF

RESISTORS

RES, CBN 1/6P	: Carbon 1/6W
RES, FUSE	: Fuse
RES, CEM 5P	: Cement 5W
RES, MTL 1P	: Metal 1W
2.2K	: 2.2kΩ
220	: 220Ω

TRANSISTORS

XISTOR	: Transistor
FET	: Field Effect Transistor

CONTROLS

RES, SEMI FIX : Semi-fixed Resistor

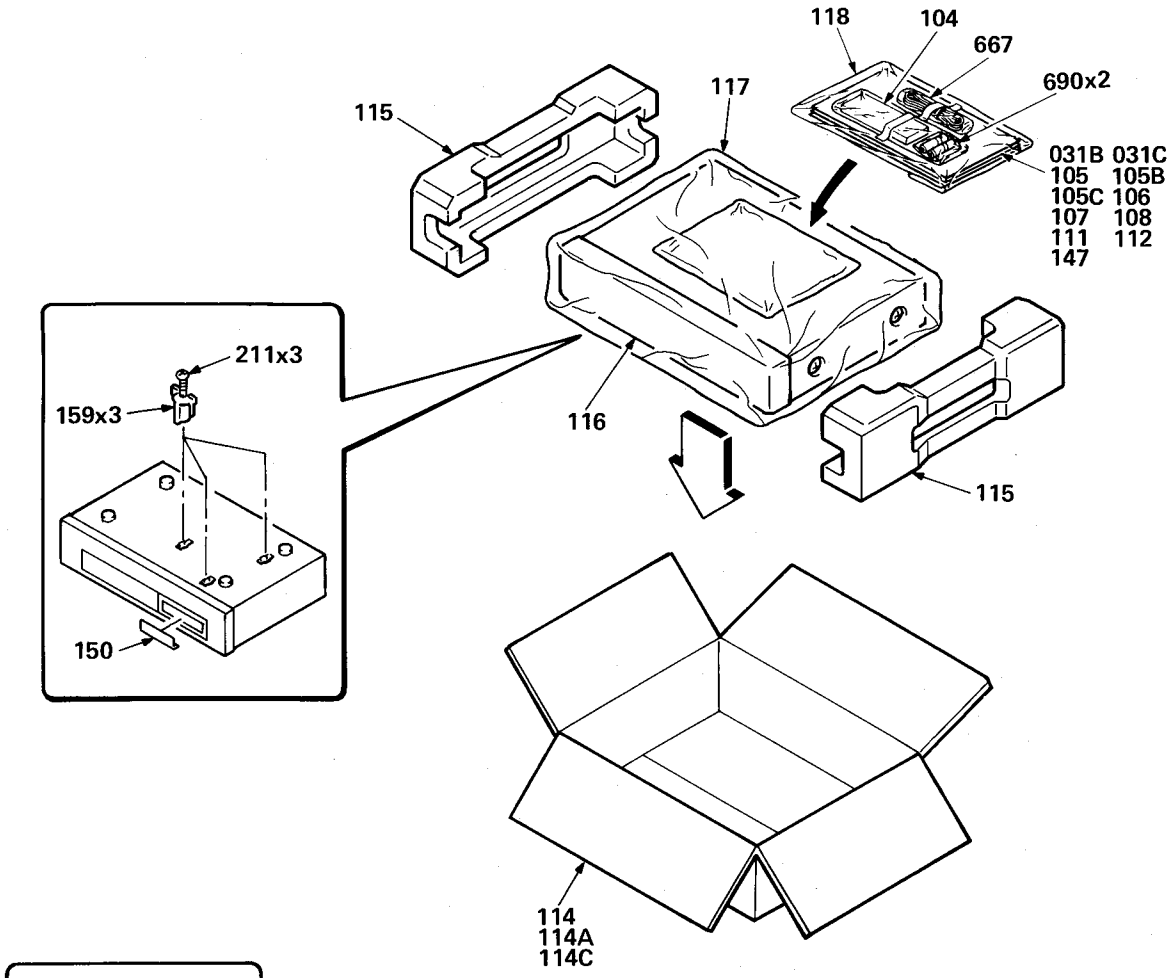
CHASSIS MISCELLANEOUS PARTS LIST

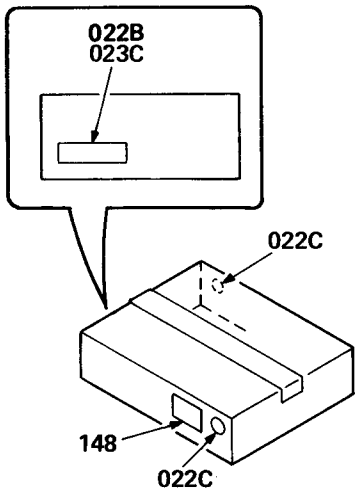
666	⚠P1	4161-01401232	CORD W/PLUG (UA) (BK)
666B	⚠P1	4161-7256	CORD W/PLUG (G)
666C	⚠P1	4161-7256	CORD W/PLUG (GB)
041B	⚠S2	4411-102729	SWITCH, ROTARY (G)
041C	⚠S2	4411-102729	SWITCH, ROTARY (GB)
683	⚠T1	5584-701548	XFORMER, POWER (UA) (BK)
683B	⚠T1	5584-702548	XFORMER, POWER (G)
683C	⚠T1	5584-702548	XFORMER, POWER (GB)
678	W-1	4162-00201800	LUG W/WIRE (W/LUG 1, LUG 2)

NOTE

⚠ SAFETY RELATED COMPONENT. USE ONLY EXACT REPLACEMENT PART AS SPECIFIED.

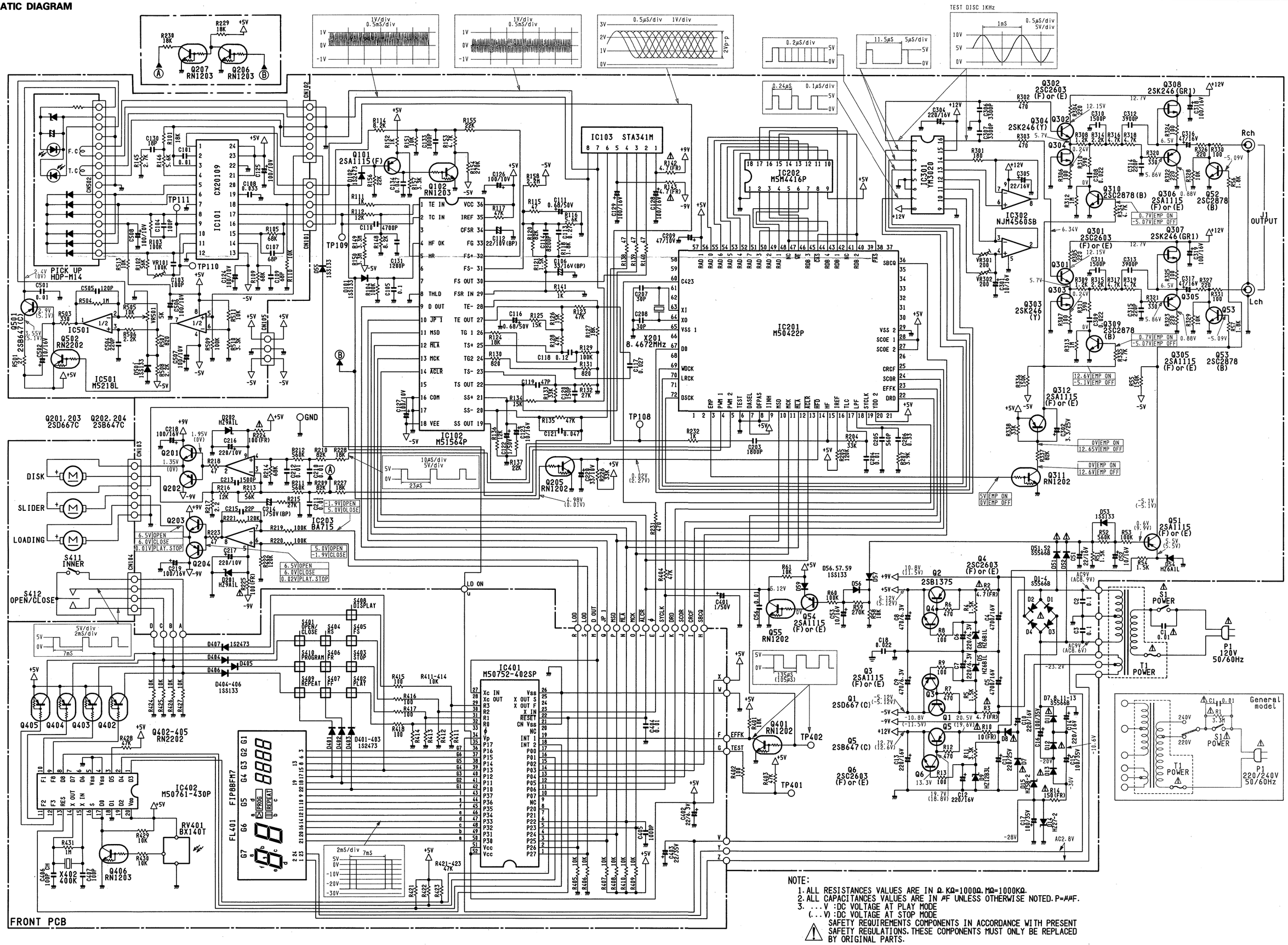
PACKAGE



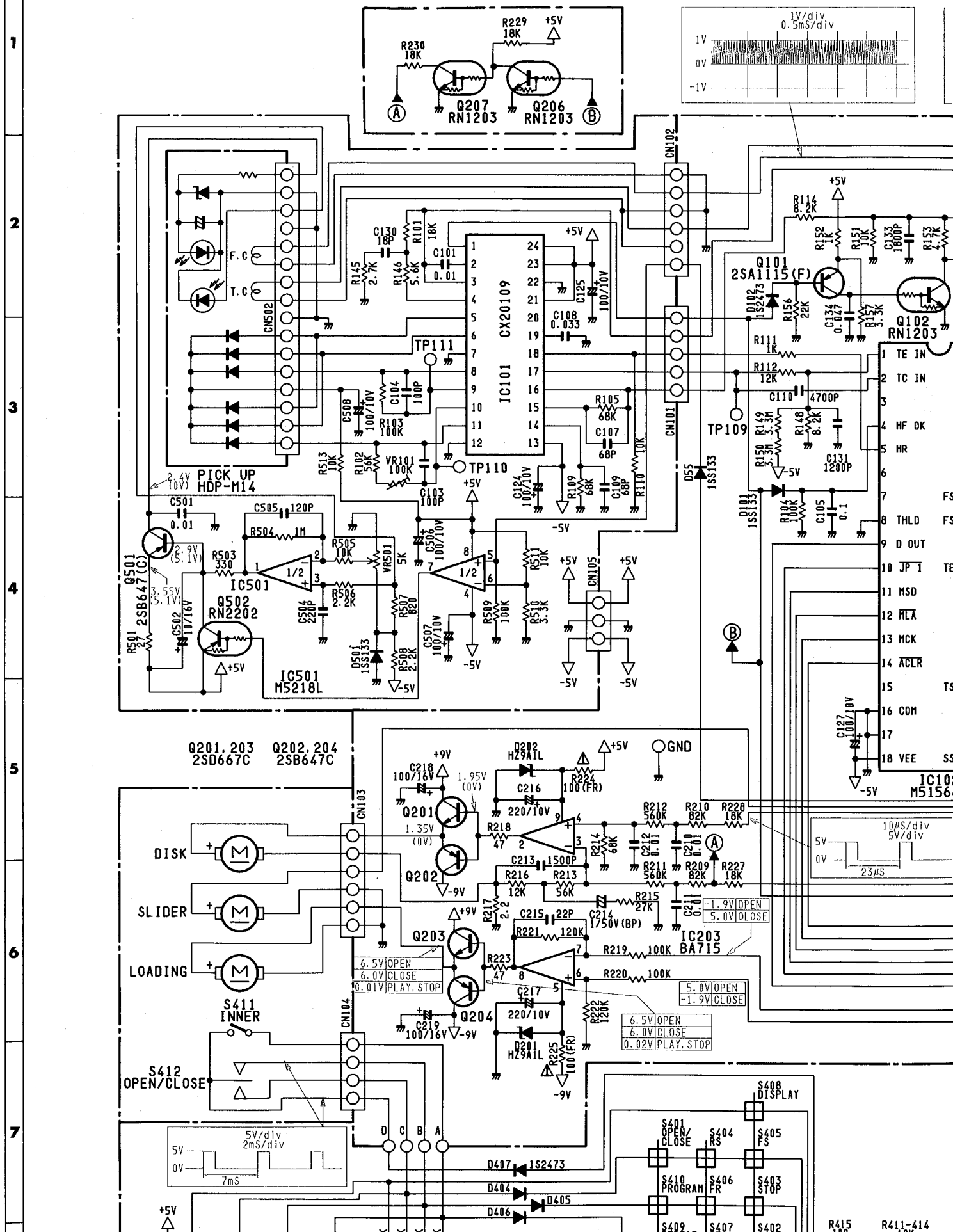


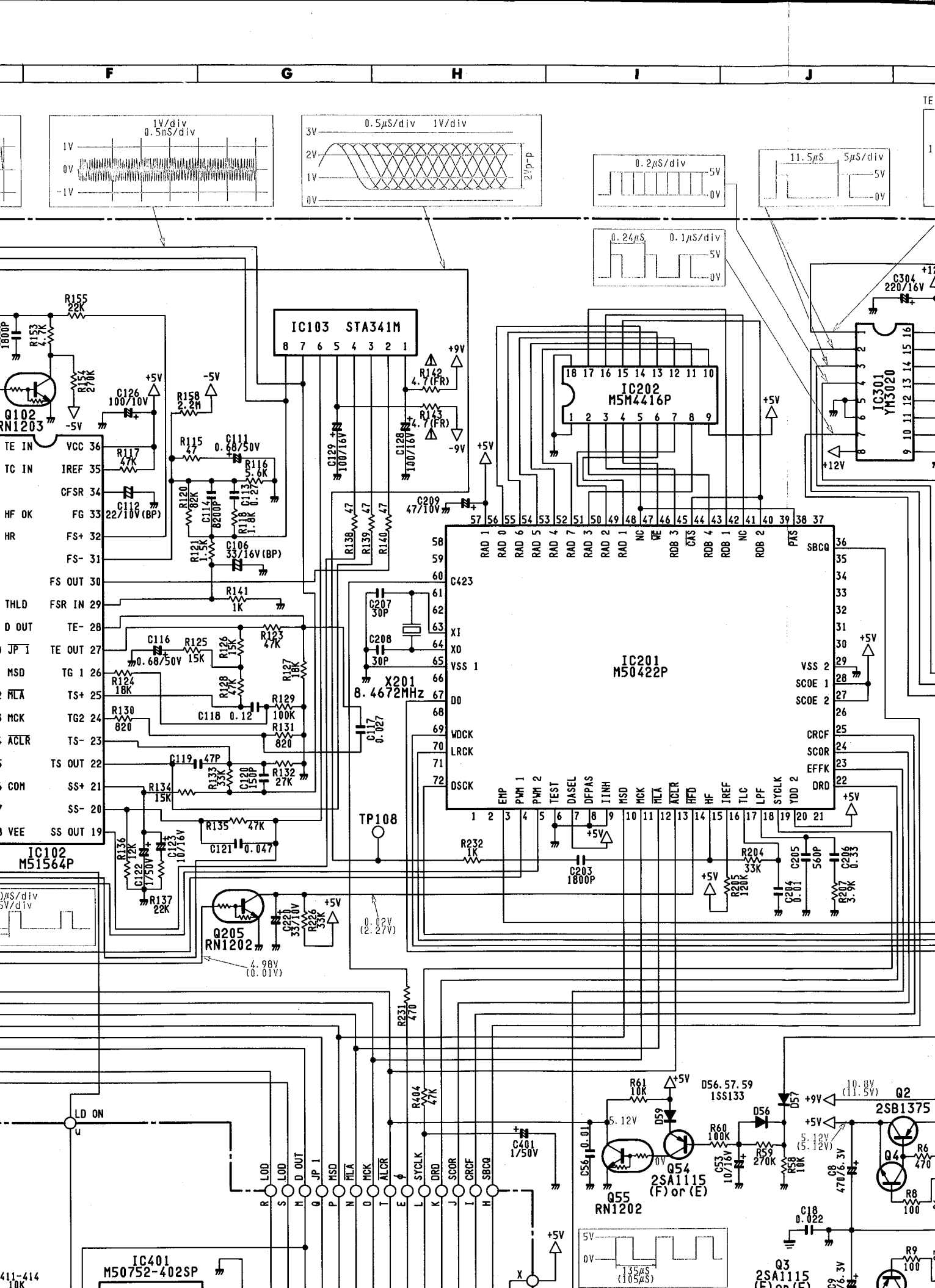
Ref. No.	Part No.	Description
022B	1756-06303	LABEL G
022C	1756-03124	LABEL GB
023C	1756-06303	LABEL GB
031B	1111-J30253	OWNER GUIDE G
031C	1111-J30253	OWNER GUIDE GB
104	6142-01102	REMOTE CONTROL UNIT
105	1111-J30285	OWNER GUIDE UA BK
105B	1111-J30286	OWNER GUIDE G
105C	1111-J30286	OWNER GUIDE GB
106	1111-J90195	UL SAFETY GUIDE UA BK
107	1113-717004	OWNER CARD UA BK
108	1111-J30254	OWNER GUIDE UA BK
111	1119-047	GUARANTY CARD UA BK
112	1119-0137	GUARANTY GUIDE UA BK
114	1221-777194	CARTON BOX UA G
114A	1221-767194	CARTON BOX BK
114C	1221-767194	CARTON BOX GB
115	1222-7306	CUSHION
116	1223-R0220055	SOFT SHEET
117	1241-R0155500	POLYETHY BAG, SET
118	1241-R0123350	POLYETHY BAG, IB
147	1756-11601	LABEL UA BK
148	1756-11701	LABEL UA BK
150	1756-12001	TRANSPORTATION CAUTION FOR LID
159	2132-7148	SPACER, TRANSPORTATION
211	2347-R0130252	SCREW BND T+, TRANSPORTATION
667	4161-71184	CORD W/PLUG, CONNECTION
690	4191-0355	BATTERY

SCHEMATIC DIAGRAM

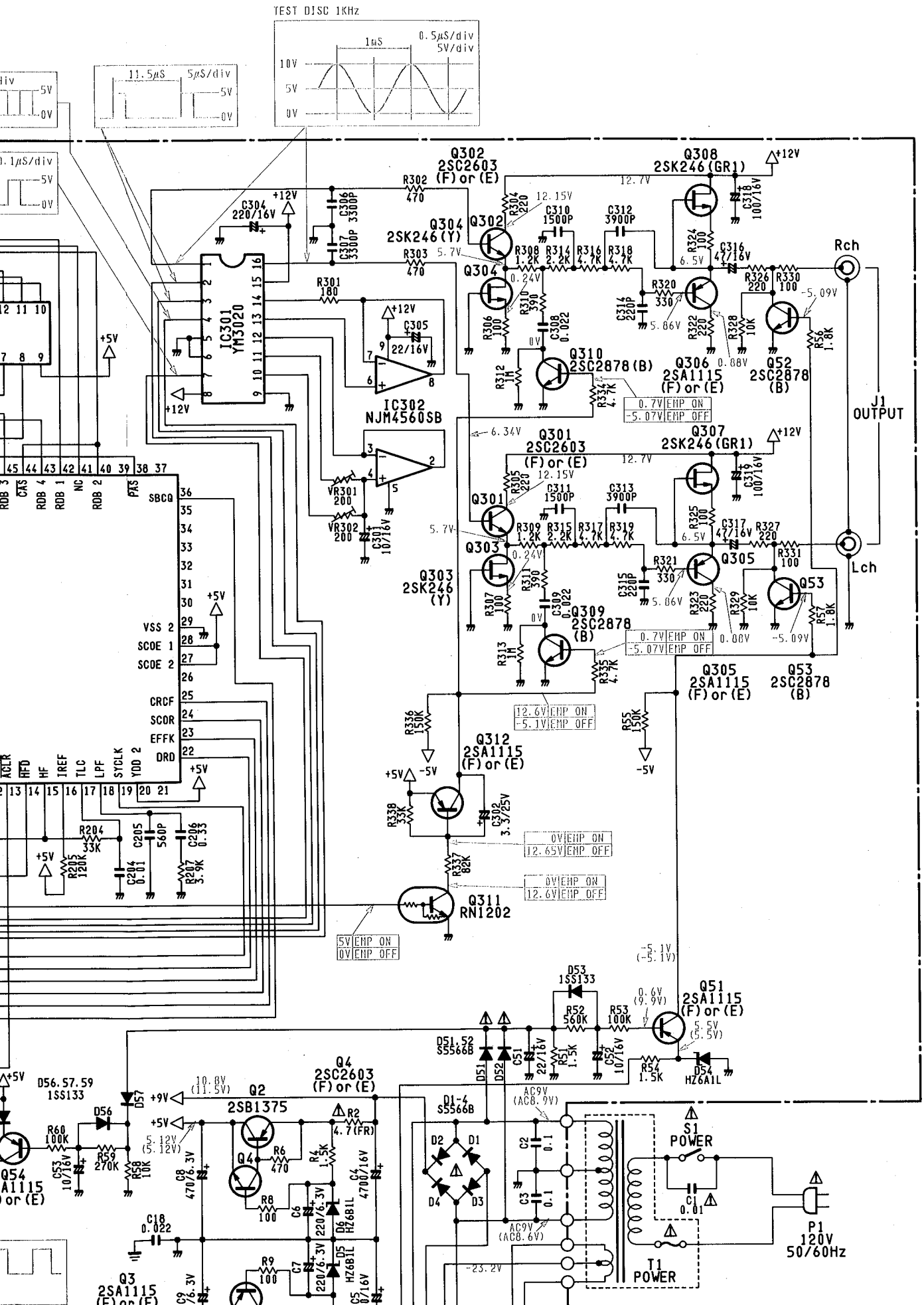


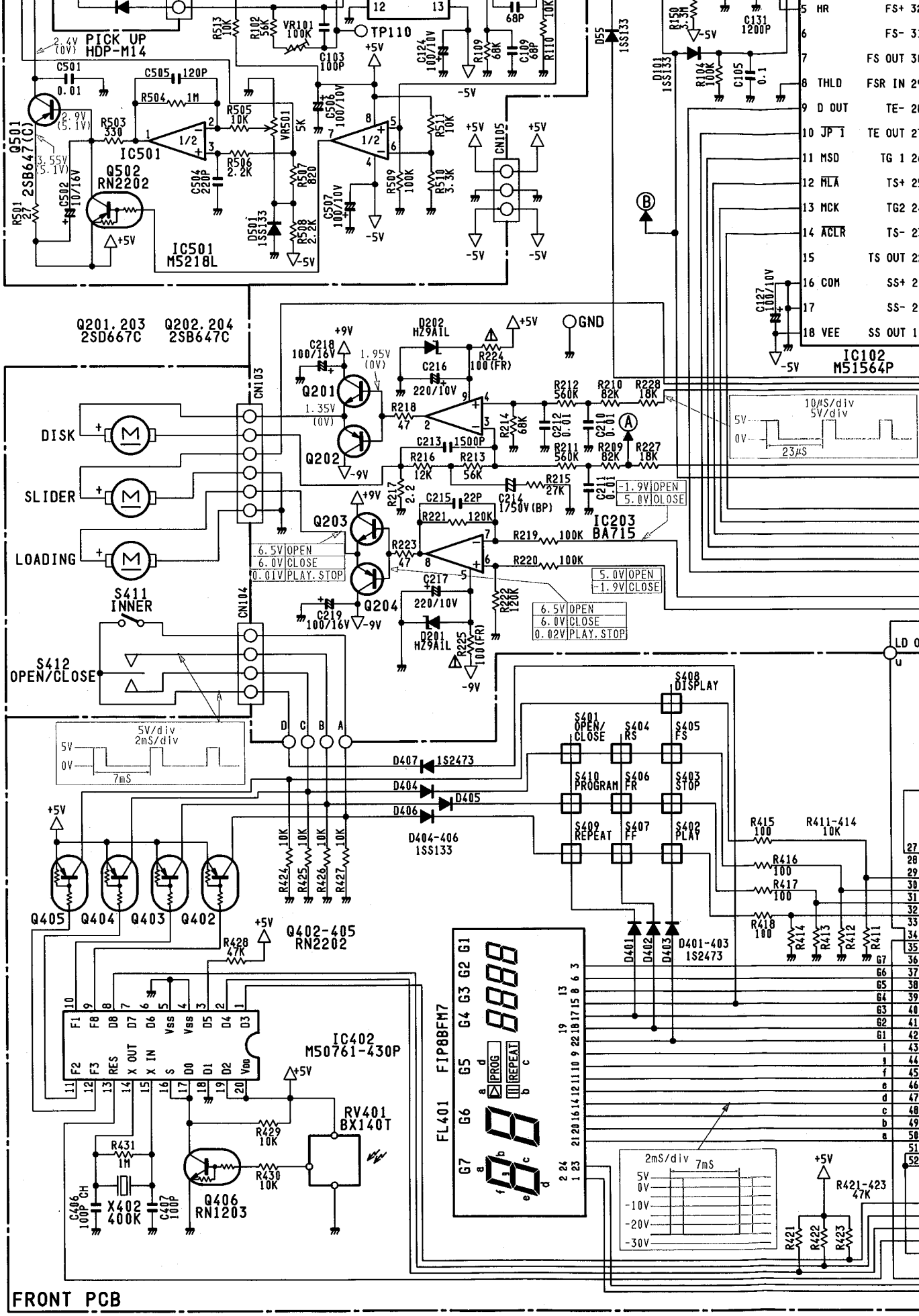
SCHEMATIC DIAGRAM

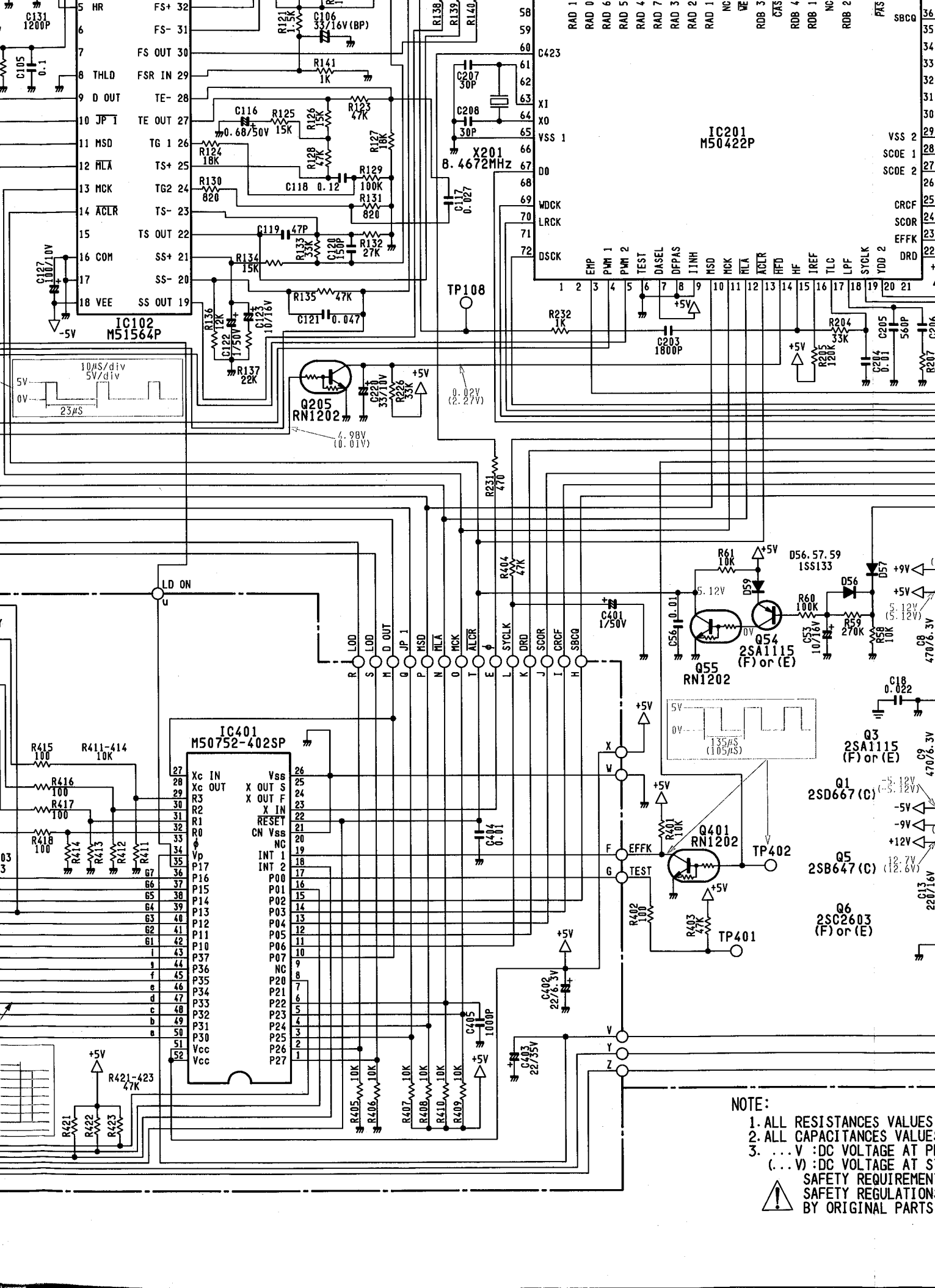


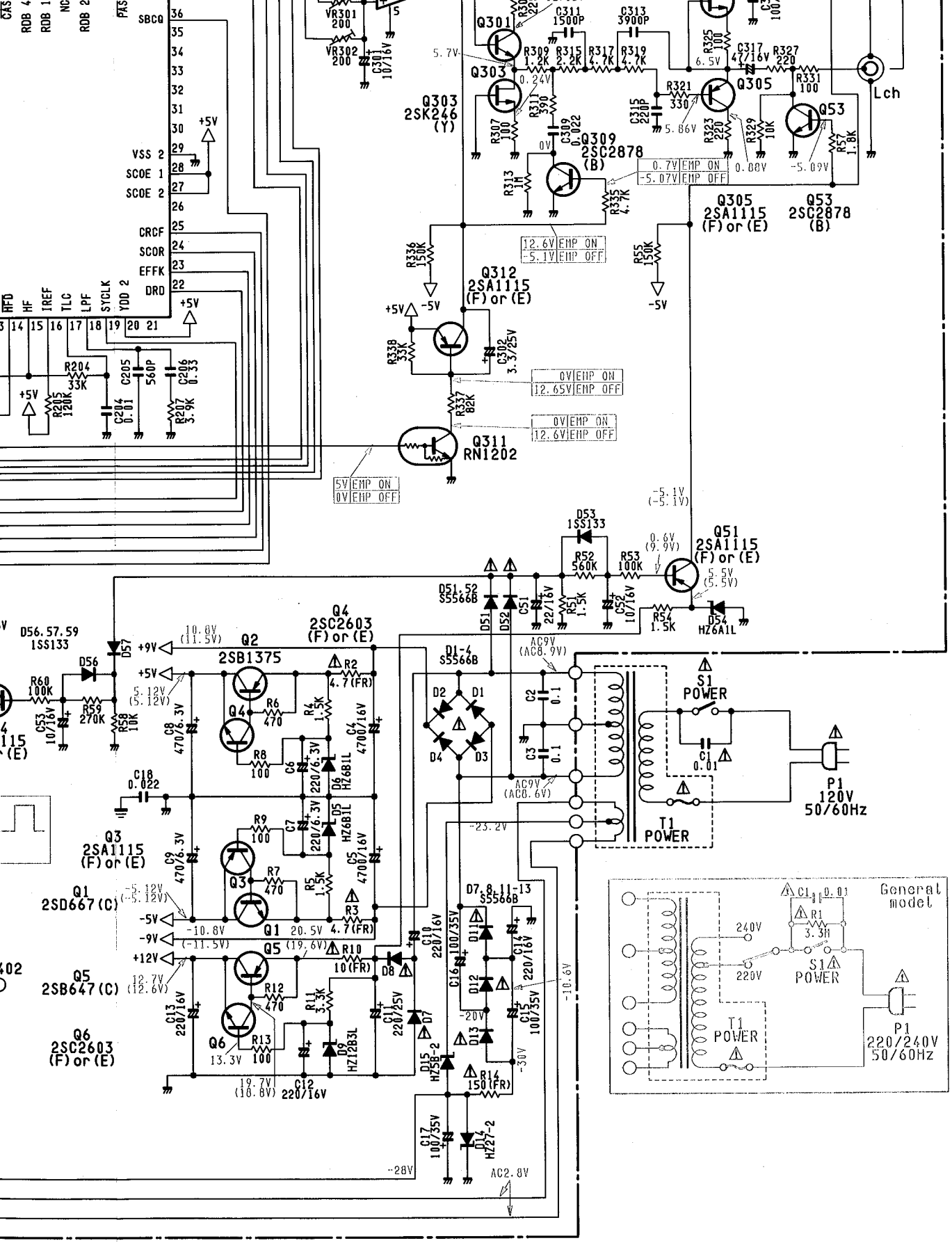

F
G
H
I
J
1V/div
0.5mS/div
0.5μS/div 1V/div
0.2μS/div
11.5μS 5μS/div
0.24μS 0.1μS/div
IC103 STA341M
IC202 M5M4416P
IC301 YM3020
IC201 M50422P
IC102 M51564P
IC401 M50752-402SP
X201 8.4672MHz
Q102 RN1203
Q205 RN1202
Q55 RN1202
Q54 2SA1115 (F) or (E)
Q2 2SB1375
Q3 2SA1115
D56.57.59 1SS133
TP108
LD ON
+5V
-5V
+9V
-9V
+12V
5.12V
4.98V (0.01V)
0.02V (2.27V)
135μS (105μS)
10.8V (11.5V)

J	K	L	M	N


TEST DISC 1KHz
1mS
0.5μS/div
5V/div
10V
5V
0V
11.5μS
5μS/div
IC301
YM3020
IC302
NJM4560SB
Q302
2SC2603
(F) or (E)
Q304
2SK246(Y)
Q308
2SK246(GR1)
Q310
2SC2878(B)
Q306
2SA1115
(F) or (E)
Q52
2SC2878
(B)
Q301
2SC2603
(F) or (E)
Q303
2SK246
(Y)
Q307
2SK246(GR1)
Q309
2SC2878
(B)
Q305
2SA1115
(F) or (E)
Q53
2SC2878
(B)
Q312
2SA1115
(F) or (E)
Q311
RN1202
Q51
2SA1115
(F) or (E)
Q4
2SC2603
(F) or (E)
Q2
2SB1375
Q3
2SA1115
(F) or (E)
Rch
Lch
J1
OUTPUT
S1
POWER
P1
120V
50/60Hz
T1
POWER
0.7V EMP ON
-5.07V EMP OFF
12.6V EMP ON
-5.1V EMP OFF
0V EMP ON
12.65V EMP OFF
0V EMP ON
12.6V EMP OFF
5V EMP ON
0V EMP OFF


PICK UP
HDP-M14
IC501
M5218L
Q501
2SB647(C)
Q502
RN2202
IC102
M51564P
Q201.203
2SD667C
Q202.204
2SB647C
DISK
SLIDER
LOADING
S411
INNER
S412
OPEN/CLOSE
IC203
BA715
Q201
Q202
Q203
Q204
CN103
CN104
S408
DISPLAY
S401
OPEN/
CLOSE
S404
RS
S405
FS
S410
PROGRAM
S406
FR
S403
STOP
S409
REPEAT
S407
FF
S402
PLAY
D401-403
1S2473
D404-406
1SS133
D407
1S2473
Q405
Q404
Q403
Q402
Q402-405
RN2202
IC402
M50761-430P
FL401
FIP8BFM7
RV401
BX140T
Q406
RN1203
X402
400K
FRONT PCB


IC102
M51564P
IC201
M50422P
X201
8.4672MHz
IC401
M50752-402SP
Q205
RN1202
Q55
RN1202
Q54
2SA1115
(F) or (E)
Q401
RN1202
Q3
2SA1115
(F) or (E)
Q1
2SD667(C)
Q5
2SB647(C)
Q6
2SC2603
(F) or (E)
TP108
TP402
TP401
LD ON
10μS/div
5V/div
23μS
135μS
(105μS)
NOTE:
1. ALL RESISTANCES VALUES
2. ALL CAPACITANCES VALUES
3. ...V :DC VOLTAGE AT PL
(...V) :DC VOLTAGE AT S
SAFETY REQUIREMEN
SAFETY REGULATION
BY ORIGINAL PARTS



LL RESISTANCES VALUES ARE IN Ω. KΩ=1000Ω. MΩ=1000KΩ.
LL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. P=μμF.
...V :DC VOLTAGE AT PLAY MODE
...V) :DC VOLTAGE AT STOP MODE
⚠ SAFETY REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.